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AN EPITOME OF THE PROGRESS OF NATURAL SCIENCE.

(Concluded from page 158.)

ALTHOUGH the nature of the universe began at an early period to attract the attention of philosophic minds, and individuals from time to time appeared, to advance the knowledge of the laws which govern the motions of the earth, as well as of its geometrical relations; yet it was reserved for the nineteenth century to produce a school of learned, acute, and disinterested men, incessantly directing the energy of their minds to the study of the structure and the ancient history of this globe. The universities of Oxford and Cambridge, which, during the past ages, had nurtured so many of those great minds which have enlarged the boundaries of physical science, have been the first to cherish geology. At the first of these Roger Bacon, in the thirteenth century, might, perhaps, but for the influence\* of the scholastic bigotry of the day, have left a renown behind him, only second to that of the immortal

\* The following anecdote was related to us at Oxford, in 1827, by a venerable clergyman, who had been connected with the university about sixty years:

"When Blackstone prepared to deliver his law lectures, he too was considered an innovator, and was made to feel, in various ways, the influence of the established opinions. In an introductory lecture of his, which unfortunately has not been published, he turned the tables very successfully upon his opponents, by the following sally:—'In those scholastic days, when the inquisitive and original mind of Roger Bacon was directed to the investigation of the laws of nature, the theological animus conspired against him, and he was accused of holding communion with evil spirits. Upon a particular occasion, when he intended to exhibit some curious experiments to a few select friends, the secret having got out, the whole town and all the colleges of this university, were in an uproar. Priests, and fellows, and students, were seen flying about in every direction, with their gowns streaming behind them, and screaming out, 'No conjurer, no conjurer!' The cry of no conjurer resounded from hall to hall,

Newton. The important contributions which Professors Buckland and Sedgwick have made to this, the most attractive science of modern times, can never be forgotten by those who commemorate its early history, and the great and beneficial impulse which it has received from that school, of which they are among the chief ornaments. But that we may the more intelligently bring that early history before our readers, we shall, in conformity with the plan hitherto pursued, rapidly notice the successive steps, by which the study of physical science has been promoted from the earliest times ; by which means the true causes of the retardment and advance of a branch of knowledge, will more conspicuously and profitably appear ; which, as has been remarked by Mr. Lyell, stands in that relation to the physical sciences, which general history does to the moral.

In the early pages of this Epitome, we have adverted to the ancient cosmogonies, and to the rise of philosophy in Greece. Pythagoras, who flourished near five hundred years B. C., appears to have had very just ideas of the true theory of the solar system ; he even proved that the earth was not an extended plane, but that it had a curvature. The elementary principles of geometry, from the necessity of the case, became known to men in the infancy of society, and Pythagoras is the most celebrated of the ancient geometers ; but the geometrical analysis, or the art of finding unknown quantities, by their relation to quantities that are known, became familiar to the Greeks at a later day. Although mathematics did not begin to flourish in Greece until philosophy and the arts had reached their height, yet geometry was well known there, before the period of those great mathematicians Euclid and Archimedes, who flourished about the third century B. C. Amongst the great astronomers of that time was Aristarchus, who taught the true solar theory ; and Hipparchus, who flourished about one hundred and forty-two years B. C., was so familiar with the heavens, that he undertook the enumeration of the stars. The ancients were familiar with the mechanical powers, sufficiently to have used them on a great scale, yet until

from cell to cell. At a later day Galileo was condemned by men, whose names are now only remembered as parts of the rubbish upon which the pedestal of his fame is raised. And in our own times there are men who seek to raise the cry of 'No conjurer' against me. I tell you, you will soon find out, these good people are no conjurers themselves."

the period of Archimedes, the principles and laws of mechanics were not laid down. His treatise on Equilibria contains an exposition of these principles. He demonstrates that masses have a common point of pressure, the centre of gravity; and shows how that centre may be found in all bodies. It was he that laid the foundation of all the inventions, which have constituted the triumph of mechanics: the machines by which he caused so protracted a defence of Syracuse against the Romans, seem, even in our day, to belong to the romance of mechanical history. When we reflect upon the causes which retard or advance knowledge, we cannot but trace the one either to an abasement of the public mind, or the other to the influence of general education, which prepares the public mind to receive and cherish its seeds. Had Archimedes lived in an intelligent age, the principles of his great discoveries, which concerned both solid and fluid bodies, would have received a more extensive application long ere our own times, and in many things we should have been anticipated by our ancestors; but although a few continued to walk in the light of his great mind, the science of statics became, as it were, stationary after his death. The same observation may be made also, in relation to the genius of Pythagoras, especially in that branch of pneumatics which relates to the theory of sound, and to which he was the first to apply the rules of arithmetical and geometrical science. The doctrine of musical chords, and their analysis into vibrations of equal and unequal spaces of time; his transfer of this harmonic scale to the motions of the heavenly bodies, which, by a grandeur of thought belonging only to a genius of the highest order, he supposed to produce sounds of the most inconceivable harmony, by impinging on the ether through which they moved, evince how much knowledge and enjoyment mankind has been deprived of, by the protracted inquiries into these the true principles of the theory of musical science.

There are two natural agents, which, from time immemorial, have interfered with the industry and the social existence of man. Of the deluges which have at repeated intervals partially overwhelmed the surface of the earth, we have abundant evidence in practical geology, as well as in the traditions of all nations; and although similar traditions of the destructive effects of volcanic power, have been less powerfully impressed upon succeeding generations, on account of its less extensive operation,

still we have in geology the most conclusive evidence of the crust of the earth having been penetrated, in every country, by the most surprising masses of mineral matter in the state of igneous fusion. Devastations of this character are less fatal to life than aqueous deluges, which afford less time for escape, and are not so easily forgotten as those which do not sweep away whole generations. It is not wonderful that we know so little of the effects produced by volcanoes in ancient times, or of the periods when they prevailed, since even the eruptions of Skapta Jokul, in Iceland, in 1783, are only known to the curious. Yet we are told, that those Icelandic lavas, spread into broad lakes of fire, sometimes from twelve to fifteen miles wide, and one hundred feet deep.

That this planet has at all times been subject to scourgings both from water and fire, is most true. The ancients believed in alternate catastrophes of this kind. The Egyptians, especially, considered them to be punitive and purifying visitations from the gods; an opinion adopted by the Stoics. The cataclysm, or deluge, swept away all organized bodies; and the ecpyrosis, or conflagration, consumed the globe itself. This doctrine has even been continued by the founders of our holy religion, who have taught that the Noachic deluge was inflicted upon the world, on account of the sins of man, and that the next punitive visitation is to be from fire. These opinions acquired greater force among the ancients by the observations they could not avoid making of fossil marine remains, buried at great elevations and distances from the ocean. Various conjectures were offered to account for this class of phenomena. The celebrated geographer, Strabo, whose extensive travels had brought the geological phenomena of many countries under his notice, and especially those attendant upon earthquakes, was the first to assert the reasonable opinion, which obtains in our day, that islands, as well as continents and seas, are sometimes elevated from below, and sometimes depressed. This is one of the many instances of a great mind having put mankind upon the right track in vain. Strabo died in the year 25 of our era, and eighteen hundred years had elapsed before this announcement of subterranean dynamics was generally recognized by geologists. In vain too, had the true solar theory been taught by Aristarchus, in the third century before Christ; near eighteen centuries elapsed before it was revived by Coperni-

cus. During the greater part of this period, and at a time when classical literature was falling into decay, the Ptolemaic system arose, which was universally received. Ptolemy flourished about one hundred and forty years after Christ, and made his system accord with external appearances, supposing the earth to be the immovable centre, and the sun and planets to revolve round it. This deceptive theory, which coincided with the figurative language used in the old Testament, was received as of divine authority ; until Galileo, in the seventeenth century, finally overthrew it, in despite of the persecutions of the inquisition and the power of the church.

Until the period when the Saracens began to cultivate letters, scarce any further progress was made in natural science, if we except the labours of Galen as an anatomist, who died A. D. 193. They were much addicted to the study of the virtues of plants, and their physicians Al Rasi, Ibn Sina, and Ibn Rosch, have been held in honour by the Europeans under the names of Razes, Avicenna, and Averroes ; but they added nothing to the knowledge of anatomy ; for the prejudices which the Koran had created against dissection were powerful, as it denounced as unclean all who touched the corpse of any dead animal. The Saracens were, however, well acquainted with the writings of Galen, and there is sufficient evidence that it is through their channel the Europeans first returned to the study of anatomy ; for many of the technical terms used upon its revival in Europe, are derived from the Arabic tongue ; such as *Nucha*, the nape of the neck ; *Meri*, the diaphragm ; *Sumach*, the umbilical region ; *Myrach*, the abdomen ; *Siphax*, the peritoneum ; and *Zirbus*, the omentum. These terms were retained by Mondino de Luzzi, his pupil Achillini, and the other European anatomists, until the revival of learning led to the study of the ancient Greek writers. Their passion for astronomy was favourable to the cultivation of arithmetic and algebra, their knowledge of which, they derived, according to Playfair, from India. The monk Gerbert, afterwards pope Sylvester 2d, had studied with the Saracens in Spain, and introduced the knowledge of algebra into christian Europe, towards the latter end of the tenth century. In mechanical science they were great proficients. As early as A. D. 799, Haroun Alraschid sent a magnificent *Clepsydra*, or water-clock, to the Emperor Charlemagne, of a remarkable construction. Chemistry, as an analytical branch

of experimental philosophy, owes its origin to the Arabians: the transmutation of base metals into gold, and the composition of a medicine that could confer immortality, were favourite pursuits of this ingenious and romantic people.

When the rays of Arabian science were reflected upon Europe, ingenious and learned men began to arise there. Among the most eminent is Roger Bacon, an Englishman, born A. D. 1214. He was a man of universal knowledge, and being a great alchemist, he was charged by the bigotry of his contemporaries with being a necromancer. Had a mind like friar Bacon's been left untrammelled, and experimental philosophy been encouraged instead of repressed, the greatest progress might have been made in physical science; but the general ignorance was too great, and the influence of the scholastic school too powerful. We cannot help contrasting here the attainments of Bacon as we have spoken of them, with those of the celebrated Thomas Aquinas, born A. D. 1224, the glory of the scholastics and theologians, known by the name of "the angelical doctor." In metaphysical and speculative discussions he was without a rival; but as to physical experiments, he denounced them, upon all occasions, as the result of necromancy. An amusing anecdote is related of this holy man, who after his death was beatified. Being induced to go and see a curious automaton figure, which uttered sounds, as if in reply to questions put to it; this far famed and holy champion of the church, fell into a prodigious fright, and rage, and lifting up his staff broke it in pieces, rejoicing that he had overcome the devil.

The Italians were among the first to cultivate those sciences which the Saracens had given to Europe. Bologna became a great medical school. In 1315, Mondino de Luzzi conducted dissections there, and became a celebrated anatomist. He followed Galen implicitly, and used the Arabic terms. Luzzi only used human subjects, a mode of illustration against which strong prejudices were entertained. His book was the text book of the anatomical schools for a century.

The influence of the scholastic school began now to decline. Remarkable chiefly for speculative absurdities, discussed in an unintelligible language, and for a corrupted theology defended by the misunderstood logic and metaphysics of the ancients; the practice of demonstrating truth by facts, which was now be-

coming more general, was in the end fatal to it. The schoolmen sought, not for truth, but for victory, by an ingenious and verbose sophistry, the great accomplishment of the day, and which was called dialectic skill. It was by such means christianity became corrupted, and an acrimonious spirit generated, which has been felt to our day. But the time was approaching when the ecclesiastical domination was to be put on the defensive; great minds were arising. Occam and Richard of Swinehead, at Oxford, and above all, Wickliffe, who, by his translation of the scriptures, gave a death blow to the scholastic system.

The fifteenth century abounds in great men and great events. The learned Greeks, whom the fortune of war had driven from their own country, had contributed greatly to break down the bigotry of the times, by giving Latin versions of ancient Greek works. The love of literature was revived, and correct criticism was substituted for false logic. Men began to think, and to study the ancient tongues, and thus the first step was taken towards a reformation in religion, by enabling men to read the scriptures in the original languages. Erasmus, Luther, and Melancthon arose, lights that could not be obscured. Erasmus did much, by the keenness of his satire, to subvert the sophistry of the schoolmen; his wit was excellent, his erudition great, and his industry untiring; though he continued a papist, no one contributed more by his conversation and writings to reclaim mankind from the delusions and ignorance of the monks, among whom he had passed a great part of his youth. About 1440 the art of printing was first made known to Europe; this art, as we see by the printed books of that period, was almost perfected as soon as discovered. This was also the age of Cosmo de Medici, of the celebrated Regio Montanus, and of Copernicus. This last philosopher, who was born A. D. 1472, began to doubt the Ptolemaic System about 1507. His work "Astronomia Instaurata," in which the true solar system is given, was not published, from excess of caution, until 1543. It was dedicated to the pope, and he died, perhaps fortunately, the day the first printed copy was delivered to him. This theory, however, the Cardinal Nicholas de Cusa had in vain attempted to revive about 1445, A. D.

The prejudices against using human subjects still continued in Italy, and Berenger of Carpi, a professor of surgery of the university of Bologna, delivered, in 1502, a private course of lec-

tures over the body of a pig. He afterwards devoted himself to anatomy, and became very celebrated. In France the same prejudices existed, and Gonthier, in whose school Vesalius, Eustachius, Fallopius,—and probably Michael Servetus of famous memory, the original discoverer of the circulation of the blood, and the victim of the brutal bigotry of the Calvinists—studied, taught the elements of the science, principally by dissection of the lower animals. But the successful individuals in animal anatomy, were Rondelet of Montpellier, and Belon of Mans. The first had studied with Gonthier. He published at Lyons, in 1554, a natural history of fishes in eighteen books, in which both the zoological and zootomical characters of these animals are given. In this book, written in the infancy of zoology, he includes all the inhabitants of the waters, whether fish, cetacea and amphibious mammalia, chelonia, (turtles,) mollusca or crustacea ; whilst at the same time he draws a line between those which breathe by gills, and those which breathe by lungs. This work is distinguished for the detail, as well as the ability with which he pursues his physiological inquiries.—This great animal anatomist died in 1566.

His cotemporary Belon of Mans, also wrote a natural history, “des Estranges Poissons Marins,” distinguished for the minuteness of his anatomical and physiological observations. But his work “L’Histoire de la Nature des Oyseaux,” published at Paris in 1555, illustrated with spirited wood cuts, is exceedingly curious, and replete with observations of a truly original character, for ornithological anatomy became for the first time a science in his hands. He was a great enthusiast, and had travelled in Greece, Arabia, India, and Egypt, devoting himself to natural history. In his quaint manner, he says,\* “No animal ever fell into my hands, that I did not dissect it, as soon as it was in my power. Whence it came that I have examined the internal parts of two hundred different species of birds. It is not strange, therefore, if I am able to describe the bones of birds, and to figure them so accurately.”

\* “One ne tumba animal entre nos mains, veu qu'il fut en notre puissance, duquel n'ayons fait anatomie. Dequoy est advenu qu'ayons regardé les intericures parties de deux cents diverses especes d'oyseaux. L'on ne doit done trouver estrange si nous des crivons maintenant les os des oyseaux, et les portrayons si exactment.”—L’Histoire de la Nature des Oyseaux. A Paris 1555. Liv. I. chap. xii.

The sixteenth century was, above all, distinguished by the reformation of religion. Luther had declared that neither religion or philosophy could be reformed, until the scholastic system, and the metaphysical theology of the schools, were utterly abolished; and he lived to witness the greatest triumph of which man ever was the hero. He died A. D. 1546, fifteen years before the birth of the celebrated Lord Bacon, as great a reformer in intellectual philosophy, as Luther had been in religion. This great philosopher taught that the qualities of bodies became known only by experiment, and that the way to arrive at truth, is to proceed step by step from what we know, till we arrive at results governed by principles of universal application; thus seeking the unknown by aid of the known. Strong as he was in experimental philosophy, and prophetic as his enlightened views were respecting future examinations of the powers of nature, yet it is as a profound logician Lord Bacon stands unrivalled. No man ever saw more distinctly how truth was to be found, nor pursued it more steadily. His great mind disdained to occupy itself with the relations of words with themselves, but applied its powers to the philosophical relation between words and things. About the same time, also, Galileo was born. His "Dialogues of the System of the World," made public about A. D. 1613, were received by men of science—and this was the age of Bacon, Kepler, Napier, &c.—with enthusiasm. They produced the final overthrow of the false system then taught, although he was twice thrown into the dungeons of the inquisition, and his book publicly burnt. Professor Scarpellini informed Mr. Lyell, at Rome, that the edicts against Galileo and the Copernican system, were finally repealed in 1818, at the instance of Pius 7th.

During this progress in the higher branches of physical science, the fossil organic remains found in almost every quarter, were too curious a phenomenon to escape the attention of inquiring minds. Some excavation made at Verona, in Italy, in 1517, for the purpose of repairing the city, had drawn the public attention to certain petrifications which abound there. The easiest way, and indeed the safest, to account for their being found buried beneath the surface, was by referring them to the action of the Noachian deluge, and was, of course, adopted by the majority. Some, however, referred them to a "plastic force," which could give organic forms to stones. Fracastoro boldly declared

his opinion, that the fossil shells had not only belonged to living animals, but that the Noachic deluge had no agency in bringing them there. Fallopio, a professor of anatomy at Padua, even taught that some Elephants' tusks, dug up at Puglia, were earthy concretions. Mercati, who, in 1574, published some figures of fossils preserved in the museum of the Vatican, declared that they owed their forms to the influence of the heavenly bodies. In 1580, Palissy, a French writer, "On the origin of springs from rain water," was the first, according to Fontenelle, to declare in Paris, that organic remains had once been vitalized. The Italians, however, in the 17th century, continued to lead in geological inquiries, and Colonna and Steno, although they conceded the position of fossil remains to be owing to the Noachic deluge, contended for their previous existence. In like manner, the interesting work of Scilla, a Sicilian painter, on the fossils of Calabria, published in 1670, with engravings, is a mixture of sound opinions, restrained by what he thought due to popular prejudice. Quirini, in a work on fossil testacea, in 1676, contended that the deluge could not have brought fossils into the situation in which some of them were found, and was the first to doubt its universality. In England, in 1677, Dr. Plot, in his "Natural History of Oxfordshire," attributed fossils to the 'plastic virtue' before spoken of. Lister, the conchologist, in 1678, thought them either "terriginous," or representing extinct animals.

Robert Hooke, M. D. in his "Discourse of Earthquakes," written in 1688, expresses many opinions, which obtain at this time. Speaking of organic remains found at great elevations, he says, they might have been raised there, by those earthquakes "which have turned plains into mountains," &c., &c.; he therefore was opposed to the hypothesis which accounted for fossils by the deluge. Ray, an able naturalist, and cotemporary with Hooke, placed a barrier in the way of his own vigorous mind, and of his sound views of physical science, by conceding to the prevailing theological opinions. Another cotemporary, Woodward, who by founding a chair at Cambridge—now filled by the Rev. Adam Sedgwick—has indirectly a claim to be considered a benefactor to geological science, entertained the most extravagant notions of the flood, teaching that the whole solid fabric of the globe had been dissolved in it, and that the strata were the result of the general

deposition. Burnet, towards the close of the seventeenth century, produced a romance under the title of "The Sacred Theory of the Earth, and of all the general changes which it hath already undergone, or is to undergo, till the consummation of all things." This work, which was so highly praised by some of his contemporaries, is a mere extravagant and theoretical fallacy; but such was the prejudice of the theologians of that day, that those who in geological matters did not acknowledge the agency of the Noachic deluge in every thing, were exposed to the imputation of infidelity. Whiston followed Burnet in his adherence to the general interpretation of the scripture account of the deluge, which he supposed to have been occasioned by the near approach of a comet. Even the great Newton did not escape these fanatics; for Hutchinson, in 1724, published his "Moses's Principia," in which he insisted that the Scriptures contained a perfect system of natural philosophy, and for which reason he and his followers objected to the theory of gravitation. Leibnitz, who claimed to be the inventor of the differential calculus, ten years after Newton had discovered the method of fluxions, so important to the precision necessary in carrying on astronomical calculations, published his *Protogaea*, in 1680. He supposed the planet to have originally been a burning mass, and that it had been cooling ever since the creation, and that the oceans were formed by the vapours which had condensed during that cooling. This hypothesis of this great mathematician was partially adopted by Buffon, De Luc, and others. Buffon's *Natural History* appeared in 1740. The hypothetical reasonings of this eloquent writer gave offence, and at the instance of the faculty of the Sorbonne, he retracted all his opinions which were deemed to be in opposition to the Mosaic account. Towards the middle of the eighteenth century, Italy produced many writers who speculated on fossils, Vallisneri, Moro, and Targioni. A Carmelite friar named Generelli, is distinguished for his judicious opinions at this time. For a spirited sketch of the progress of geological inquiry, in Italy, at this period, we refer our readers to Mr. Lyell's "Principles of Geology," an eloquent modern work, in the possession of every naturalist. The Italians were greatly excited to this study, by the fossils in the sub-appenine formations, which lie on the flanks of the older rocks, and by the vast quantities of remains of extinct quadrupeds found in the plains of their country, and which some wri-

ters referred to the period of the ancient Romans and of Hannibal, as Mr. Rankin, in his extravagant writings, pretends still to think.

The order of superposition of beds, began now to be understood. Arduino and Lehman, in 1759, both recognized the distinction between primary, secondary, and tertiary rocks. In 1760, the Rev. John Michell, Woodwardian professor at Cambridge, wrote an admirable essay in the *Philosophical Transactions*, on the cause and phenomena of Earthquakes, suggested by the great earthquake at Lisbon, five years before. In 1762, Fuchsel, a physician of Rudelstadt, in Germany, published his "Historia Terræ et Maris." He was a practical geologist, and is the first who described the Muschelkalk, a bed peculiar to Germany, in Europe, but which we have some reason to think has its equivalent here. The name of this excellent observer has been but recently brought forward.\* The classification made by Werner, and published 1787, appears to be far short of the progress already made by Fuschel. Raspe, in 1763, in an able work, called the attention of naturalists to the new Islands that from time to time had appeared, urging them to study nature "in the act of parturition." In 1766, Brander published his *Fossilia Hantoniensia*, with excellent figures of the tertiary shells. In 1780, Soldani produced some able papers, on the comparative position of undisturbed fossils, with that of recent Testacea and Zoophytes. He also first observed that the beds of the Parisian basin were alternate deposits of marine and fresh water strata.

About this time Pallas, a distinguished Russian naturalist, announced the order of superposition of the lower beds in the Silesian chains, which was further illustrated by the observations of the celebrated Saussure in the Alps: he aided greatly in reducing to a regular study, the specification of beds, and the grouping of them into formations. Hitherto, geological phenomena had been considered rather as curious subjects for discussion, than as having a bearing upon each other of a high philosophical character. Important steps had been taken towards opening the consideration of the structure of the planet, in a way worthy of so lofty a subject; but the effort having been made in an insulated and detached manner, had not concentrated to a point. It was reserved for the celebrated German mineralogist, Werner, to draw the

\* See M. Keferstein's Memoir. *Journal de Geologie*, Oct. 1830. p. 191.

attention of mankind to the subject, by one of those splendid generalizations, which, being apparently founded on observation, was for a long time implicitly received.

Werner, in 1775, was appointed Professor of Mineralogy, in the school of Mines, at Freyberg in Saxony. Familiar with the regular succession of rocks, as well by the labours of his predecessors, as by his own observations, he had—without being original in his views in relation to superposition—the great merit of pointing out the application of particular phenomena, to the purposes of mining. An eloquent enthusiast, and skilled in mineralogy, he soon raised up a brilliant school, to which men of genius resorted from distant countries. His opinions were received as oracular, and disseminated over Europe. To the school of Werner we owe some of the most distinguished mineralogists. It is probable that the success he met with as a mineralogist, was the principal cause of his failure as a geologist, for his illustrations were drawn from Freyberg and its immediate vicinity. He therefore imagined a system which had scarce any other basis than the limited phenomena around him, and with an amount of observation, that in these days would scarce exceed the personal investigations due to an ordinary memoir in the geological transactions, declared—what the united labours of the most gifted and practical geologists of the present day, have not ventured to do—the law of the structure of the planet. He taught that the universal crust of the earth was formed of beds successively precipitated from a common menstruum, in the which he included the whole class of intrusive rocks, now universally recognized to be of igneous origin. Nothing has been more fatal to his reputation, in Germany, as a geologist, than the manner in which he overlooked the igneous nature of the rocks in his own vicinity, where porphyry—which he included in his primitive rocks—not only sends from below its jets and dikes through the secondary rocks, but overlies the strata of the coal formation in mass. His flötz rocks too, which he represented as universally horizontal, are, even in the Hartz mountains—close to his type—very highly inclined; so that his partizans found themselves either obliged to renounce his system, or to contend for the possibility of entire formations being at the same time horizontal and perpendicular. This too, when Arduino, Desmaretz, Collini, Faujas, and especially his countryman Raspe, all of whom preceded him, had fully shown

the agreement of trap rocks with volcanic products. Werner, therefore, who could not be ignorant of these facts, availing himself of his influence, preferred, as it would seem, to sustain an hypothesis based upon his own inventive imagination, to the truths which nature taught, and which had been very ably brought forward. This substitution of his hypothesis had for a long period, the effect of suppressing the truth, and of retarding the advancement of geological knowledge.

Whilst in Europe the influence of Werner's geological theory has entirely passed away, it is due to the memory of that great mineralogist to say, that the progress in mineralogical knowledge is to be attributed to the school he formed; and that the very awaking which geological science has received, arose from the boldness of his hypothesis, the enthusiasm with which it was maintained by him and his disciples, and the inquiries it provoked. Those who obstinately explained all phenomena by the doctrine of aqueous precipitates, soon received the designation of *Nep tunists*, in opposition to that of *Vulcanists*, which was given to the other side, and of whom Hutton, the cotemporary of Werner, was the most conspicuous member. He was a man of unwearied activity and application, who examined for himself, and who sought to account for all geological phenomena by the reasonable action of known natural agents. In 1788, he published his "Theory of the Earth." He presents the earth to us as a pure self-acting machine, operating eternal degradations and renewals. Continents worn down by external circumstances, their ruins carried by streams into the oceans, there consolidated by subterranean heat and pressure, to be again raised up by subterranean power. Satisfied that trap rocks were of igneous origin, and finding that the phenomena of veins and dykes belonging to it, were common to the granite, he came to the conclusion, that the primary rocks were not formed from aqueous deposits, but from mineral matter in a state of igneous fusion. To this opinion, the geological theory has been for some time steadily tending: but that part of his doctrine which implies that all the changes which have taken place in the globe, have been the result of causes co-efficient with all time, and that the energy of subterranean power, as far as the whole globe is concerned, has at all times been uniform, is deemed insufficient by the greater portion of accredited geologists; who neither admit the inconceivable

immensity of time involved in the theory, nor the uniformity of action alluded to; seeing that the proofs are co-extensive with investigations made in the most distant parts of the globe, that until the period of the lower secondary rocks, the evidences of an immeasurable and peculiar subterranean power, form the most obvious of all the geological phenomena; and from which we may, in conjunction with other important branches, infer the future establishment of a geological theory of a progressive character, rather than one of uniform mutations.

For a long time the opinions of Hutton were injurious to the advancement of sound geological knowledge; for though he was much nearer the truth than his Wernerian adversaries, still, inferences were raised, which gave occasion to the imputation of atheistical tendency, and thus an alliance was formed between the Wernerians and the theologicogeologists, who were less concerned for the safety of science, than for the Mosaic account of the creation and the Noachic deluge; and thus, with many, geology was brought into disrepute. But the controversies and illiberalities to which these conflicting opinions gave rise, are now happily buried, never to be revived, as long as the spirit which now prevails, of reasoning from facts alone, shall have authority in science.

About the time that Hutton's published opinions were bringing their attacks upon him, a young man named William Smith, born in 1769, a native of Churchill, in Oxfordshire, who followed the profession of a mineral and land surveyor, was, unaided, silently laying down the foundations of true geological knowledge. Fossils had been the playthings of his childhood, and when at a mature age he recognized them imbedded in the rocks he was traversing, they received more than ordinary attention from him. He not only learned to distinguish them wherever he found them, but the rocks in which they were imbedded, however remotely they might be situated; for he found that particular fossils were peculiar to rocks that observed an uniform succession to each other as to superposition. These discoveries led him to examine with more attention than had hitherto been done, the range and extent of the successive deposits, with their general line of dip. In this manner he proceeded from step to step, until he had examined extensive territorial surfaces, and had satisfied himself that the order of succession of the rocks was never inverted,

and that the true way to identify them was by their imbedded fossils. Thus did an unaided, and unpretending individual, arrive, by his own sagacity, and laborious investigations, at the great fundamental truths of the geological structure of the planet, in a much clearer manner than all the older geologists, Werner included. His ‘Tabular View of the British Strata,’ was published in 1790; and in 1815 he published his great Geological Map of England, which drew from D’Aubisson, one of Werner’s most celebrated pupils, the following distinguished tribute of admiration—“*that what many celebrated mineralogists had accomplished for a small part of Germany in the course of half a century, had been effected by a single individual for the whole of England.*”\*

The intemperance with which the controversies between the Neptunists and Vulcanists had been carried on, at length fatigued all parties, and a re-action took place, of the most beneficial character: a spirit of caution grew up, which rejected hypothesis of every kind. The lovers of nature began, as it were, by common consent, to atone to her for the neglect she had received by the past indulgence in so much speculative imagination. Men began now to collect facts with great activity and scrupulousness. The Geological Society of London, was established in 1807, for the purpose of multiplying and recording those facts. Its success has been complete; it has rescued geology from every unfriendly prejudice, and has raised up a school of eminent men, who, by their disinterested and active labours, have made Geology the most attractive and popular of all the sciences. In 1830, the French naturalists, many of whose names we shall have occasion to mention hereafter with all praise, perceiving the usefulness of the Geological Society of London, and the influence which it was acquiring in Europe, established one in Paris, under the title of “Societé Géologique de France.”

In this hasty sketch we have not ventured to speak of the labours of Cuvier, and of the extent of the obligations which natural history is under to him. Those labours are too extensive, too minute, and of too universal a character; his opinions too remarkable for the judgment and sagacity of their author, to permit any other expression of his merits, than that he is to this age what Aristotle was to his own.

We wish, in concluding this epitome, we could say that the

\* See July number, page 29.

impulse which practical geology once received in this country from William Maclure had been continued. We look with confidence to the future.

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THE JOURNAL OF COL. CROGHAN.

AFTER the peace of 1763, Col. Croghan was sent by the British government to explore the country adjacent to the Ohio river, and to conciliate the Indian nations, who had hitherto acted with the French. As the Editor possesses the original journal kept during this interesting expedition, he has thought it would be gratifying to his readers to transfer it to his pages. The present inhabitants of that fertile territory, will no doubt be pleased with this document, which describes so minutely, their now highly cultivated and populous country, when it knew no dominion but that of the Indians, and the *fera natura* of the forests, and waters. The list of the tribes of Indians in the northern parts of North America is both curious and valuable. Col. Croghan was, perhaps, the first European, or even white man, who personally visited Big-bone Lick, now become an object of so much interest to naturalists, and which is here noticed.

The Editor will esteem himself much obliged to any of his readers, who will favour him with documents of a similar character, and which have not yet been published. ED.

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May 15<sup>th</sup>, 1765. I set off from Fort Pitt with two batteaux, and encamped at Chartier's Island, in the Ohio, three miles below Fort Pitt.

16th. Being joined by the deputies of the Senecas, Shawnesse, and Delawares, that were to accompany me, we set off at 7 o'clock in the morning, and at 10 o'clock arrived at the Log's Town, an old settlement of the Shawnesse, about seventeen miles from Fort Pitt, where we put ashore, and viewed the remains of that village, which was situated on a high bank, on the south side of the Ohio river, a fine fertile country round it. At 11 o'clock we re-embarked and proceeded down the Ohio to the mouth of Big Beaver Creek, about ten miles below the Log's Town: this creek empties itself between two fine rich bottoms, a mile wide on each side from the banks of the river to the highlands.

About a mile below the mouth of Beaver Creek we passed an old settlement of the Delawares, where the French, in 1756, built a town for that nation. On the north side of the river some of the stone chimneys are yet remaining ; here the highlands come close to the banks, and continue so for about five miles. After which we passed several spacious bottoms on each side of the river, and came to Little Beaver Creek, about fifteen miles below Big Beaver Creek. A number of small rivulets fall into the river on each side. From thence we sailed to Yellow creek, being about fifteen miles from the last mentioned creek ; here and there the hills come close to the banks of the river on each side, but where there are bottoms, they are very large, and well watered ; numbers of small rivulets running through them, falling into the Ohio on both sides. We encamped on the river bank, and find a great part of the trees in the bottoms are covered with grape vines. This day we passed by eleven islands, one of which being about seven miles long. For the most part of the way we made this day, the banks of the river are high and steep. The course of the Ohio from Fort Pitt to the mouth of Beaver Creek inclines to the north-west ; from thence to the two creeks partly due west.

17th. At 6 o'clock in the morning we embarked, and were delighted with the prospect of a fine open country on each side of the river as we passed down. We came to a place called the Two Creeks, about fifteen miles from Yellow Creek, where we put to shore ; here the Senecas have a village on a high bank, on the north side of the river ; the chief of this village offered me his service to go with me to the Illinois, which I could not refuse for fear of giving him offence, although I had a sufficient number of deputies with me already. From thence we proceeded down the river, passed many large, rich, and fine bottoms ; the highlands being at a considerable distance from the river banks, till we came to the Buffalo Creek, being about ten miles below the Seneca village ; and from Buffalo Creek we proceeded down the river to Fat Meat Creek, about thirty miles. The face of the country appears much like what we met with before ; large, rich, and well watered bottoms, then succeeded by the hills pinching close on the river ; these bottoms, on the north side, appear rather low, and consequently subject to inundations, in the spring of the year, when there never fails to be high freshes in the Ohio, ow-

ing to the melting of the snows. This day we passed by ten fine islands, though the greatest part of them are small. They lay much higher out of the water than the mainland, and of course less subject to be flooded by the freshes. At night we encamped near an Indian village. The general course of the river from the Two Creeks to Fat Meat Creek inclines to the south-west.

18th. At 6 o'clock, A. M. we set off in our batteaux ; the country on both sides of the river appears delightful ; the hills are several miles from the river banks, and consequently the bottoms large ; the soil, timber, and banks of the river, much like those we have before described ; about fifty miles below the Fat Meat Creek, we enter the long reach, where the river runs a straight course for twenty miles, and makes a delightful prospect ; the banks continue high ; the country on both sides, level, rich, and well watered. At the lower end of the reach we encamped. This day we passed nine islands, some of which are large, and lay high out of the water.

19th. We decamped at six in the morning, and sailed to a place called the Three Islands, being about fifteen miles from our last encampment ; here the highlands come close to the river banks, and the bottoms for the most part—till we come to the Muskingum (or Elk) river—are but narrow : this river empties itself into the Ohio about fifteen miles below the Three Islands ; the banks of the river continue steep, and the country is level for several miles back from the river. The course of the river from Fat Meat Creek to Elk River, is about south-west and by south. We proceeded down the river about fifteen miles, to the mouth of Little Conhawa River, with little or no alteration in the face of the country ; here we encamped in a fine rich bottom, after having passed fourteen islands, some of them large, and mostly lying high out of the water. Here buffaloes, bears, turkeys, with all other kinds of wild game are extremely plenty. A good hunter, without much fatigue to himself, could here supply daily one hundred men with meat. The course of the Ohio, from Elk River to Little Conhawa, is about south.

20th. At six in the morning we embarked in our boats, and proceeded down to the mouth of Hochocken or Bottle River, where we were obliged to encamp, having a strong head wind against us. We made but twenty miles this day, and passed by five very fine islands ; the country the whole way being rich

and level, with high and steep banks to the rivers. From here I despatched an Indian to the Plains of Scioto, with a letter to the French traders from the Illinois residing there, amongst the Shawnesse, requiring them to come and join me at the mouth of Scioto, in order to proceed with me to their own country, and take the oaths of allegiance to his Britannic Majesty, as they were now become his subjects, and had no right to trade there without license. At the same time, I sent messages to the Shawnesse Indians to oblige the French to come to me in case of refusal.

21st. We embarked at half past 8 o'clock in the morning, and sailed to a place called the Big Bend, about thirty-five miles below Bottle River. The course of the Ohio, from Little Conhawa River to Big Bend, is about south-west by south. The country hereabouts abounds with buffaloe, bears, deer, and all sorts of wild game, in such plenty, that we killed out of our boats as much as we wanted. We proceeded down the river to the Buffalo Bottom, about ten miles from the beginning of the Big Bend, where we encamped. The country on both sides of the river, much the same as we passed the day before. This day we passed nine islands, all lying high out of the water.

22d. At half an hour past 5 o'clock, set off and sailed to a place, called the Alum Hill, so called from the great quantity of that mineral found there by the Indians; this place lays about ten miles from Buffalo Bottom; thence we sailed to the mouth of Great Conhawa River, being ten miles from the Alum Hill. The course of the river, from the Great Bend to this place, is mostly west; from hence we proceeded down to Little Guyondott River, where we encamped, about thirty miles from Great Conhawa; the country still fine and level; the banks of the river high, with abundance of creeks and rivulets falling into it. This day we passed six fine islands. In the evening one of our Indians discovered three Cherokees near our encampment, which obliged our Indians to keep out a good guard the first part of the night. Our party being pretty strong, I imagine the Cherokees were afraid to attack us, and so ran off.

23d. Decamped about five in the morning, and arrived at Big Guyondott, twenty miles from our last encampment: the country as of yesterday; from hence we proceeded down to Sandy River, being twenty miles further; thence to the mouth of Scioto, about forty miles from the last mentioned river. The general course

of the river, from Great Conhawa to this place, inclines to the south-west. The soil rich, the country level, and the banks of the river high. The soil on the banks of Scioto, for a vast distance up the country, is prodigious rich, the bottoms very wide, and in the spring of the year, many of them are flooded, so that the river appears to be two or three miles wide. Bears, deer, turkeys, and most sorts of wild game, are very plenty on the banks of this river. On the Ohio, just below the mouth of Scioto, on a high bank, near forty feet, formerly stood the Shawnesse town, called the Lower Town, which was all carried away, except three or four houses, by a great flood in the Scioto. I was in the town at the time, though the banks of the Ohio were so high, the water was nine feet on the top, which obliged the whole town to take to their canoes, and move with their effects to the hills. The Shawnesse afterwards built their town on the opposite side of the river, which, during the French war, they abandoned, for fear of the Virginians, and removed to the plains on Scioto. The Ohio is about one hundred yards wider here than at Fort Pitt, which is but a small augmentation, considering the great number of rivers and creeks, that fall into it during the course of four hundred and twenty miles; and as it deepens but very little, I imagine the waters sink, though there is no visible appearance of it. In general all the lands on the Scioto River, as well as the bottoms on Ohio, are too rich for any thing but hemp, flax, or Indian corn.

24th, 25th, and 26th. Stayed at the mouth of Scioto, waiting for the Shawnesse and French traders, who arrived here on the evening of the 26th, in consequence of the message I sent them from Hochenck, or Bottle Creek.

27th. The Indians requested me to stay this day, which I could not refuse.

28th. We set off: passing down the Ohio, the country on both sides the river level; the banks continue high. This day we came sixty miles; passed no islands. The river being wider and deeper, we drove all night.

29th. We came to the little Miame River, having proceeded sixty miles last night.

30th. We passed the great Miame River, about thirty miles from the little river of that name, and in the evening arrived at the place where the elephants' bones are found, where we encamped, in-

tending to take a view of the place next morning. This day we came about seventy miles. The country on both sides level, and rich bottoms well watered.

31st. *Early in the morning we went to the great Lick, where those bones are only found, about four miles from the river, on the south-east side. In our way we passed through a fine timbered clear wood; we came into a large road which the buffaloes have beaten, spacious enough for two wagons to go abreast, and leading straight into the Lick.* It appears that there are vast quantities of these bones lying five or six feet under ground, which we discovered in the bank, at the edge of the Lick. We found here two tusks above six feet long; we carried one, with some other bones, to our boats, and set off. This day we proceeded down the river about eighty miles, through a country much the same as already described, since we passed the Scioto. In this day's journey we passed the mouth of the River Kentucky, or Holsten's River.

*June 1st.* We arrived within a mile of the Falls of Ohio, where we encamped, after coming about fifty miles this day.

2d. Early in the morning we embarked, and passed the Falls. The river being very low we were obliged to lighten our boats, and pass on the north side of a little island, which lays in the middle of the river. In general, what is called the Fall here, is no more than rapids; and in the least fresh, a batteau of any size may come and go on each side without any risk. This day we proceeded sixty miles, in the course of which we passed Pidgeon River. The country pretty high on each side of the River Ohio.

3d. In the forepart of this day's course, we passed high lands; about midday we came to a fine, flat, and level country, called by the Indians the Low Lands; no hills to be seen. We came about eighty miles this day, and encamped.

4th. We came to a place called the Five Islands; these islands are very long, and succeed one another in a chain; the country still flat and level, the soil exceedingly rich, and well watered. The high lands are at least fifty miles from the banks of the Ohio. In this day's course we passed about ninety miles, the current being very strong.

5th. Having passed the Five Islands, we came to a place called the Owl River. Came about forty miles this day. The country the same as yesterday.

6th. We arrived at the mouth of the Ouabache, where we found a breast-work erected, supposed to be done by the Indians. The mouth of this river is about two hundred yards wide, and in its course runs through one of the finest countries in the world, the lands being exceedingly rich, and well watered ; here hemp might be raised in immense quantities. All the bottoms, and almost the whole country abounds with great plenty of the white and red mulberry tree. These trees are to be found in great plenty, in all places between the mouth of Scioto and the Ouabache : the soil of the latter affords this tree in plenty as far as Ouicatton, and some few on the Miame River. Several large fine islands lie in the Ohio, opposite the mouth of the Ouabache, the banks of which are high, and consequently free from inundations ; hence we proceeded down the river about six miles to encamp, as I judged some Indians were sent to way-lay us, and came to a place called the Old Shawnesse Village, some of that nation having formerly lived there. In this day's proceedings we came about seventy-six miles. The general course of the river, from Scioto to this place, is south-west.

7th. We stayed here, and despatched two Indians to the Illinois by land, with letters to Lord Frazer, an English officer, who had been sent there from Fort Pitt, and Monsieur St. Ange, the French commanding officer at Fort Chartres, and some speeches to the Indians there, letting them know of my arrival here ; that peace was made between us and the Six Nations, Delawares, and Shawnesse, and of my having a number of deputies of those nations along with me, to conclude matters with them also on my arrival there. This day one of my men went into the woods and lost himself.

8th. At day-break we were attacked by a party of Indians, consisting of eighty warriors of the Kiccapoos and Musquattimes, who killed two of my men and three Indians, wounded myself and all the rest of my party, except two white men and one Indian ; then made myself and all the white men prisoners, plundering us of every thing we had. A deputy of the Shawnesse who was shot through the thigh, having concealed himself in the woods for a few minutes after he was wounded—not knowing but they were southern Indians, who are always at war with the northward Indians—after discovering what nation they were, came up to them and made a very bold speech, telling them that

the whole northward Indians would join in taking revenge for the insult and murder of their people ; this alarmed those savages very much, who began excusing themselves, saying their fathers, the French, had spirited them up, telling them that the Indians were coming with a body of southern Indians to take their country from them, and enslave them ; that it was this that induced them to commit this outrage. After dividing the plunder, (they left great part of the heaviest effects behind, not being able to carry them,) they set off with us to their village at Ouattonon, in a great hurry, being in dread of a pursuit from a large party of Indians they suspected were coming after me. Our course was through a thick woody country, crossing a great many swamps, morasses, and beaver ponds. We travelled this day about forty-two miles.

9th. An hour before day we set out on our march ; passed through thick woods, some high lands, and small savannahs, badly watered. Travelled this day about thirty miles.

10th. We set out very early in the morning, and marched through a high country, extremely well timbered, for three hours ; then came to a branch of the Ouabache, which we crossed. The remainder of this day we travelled through fine rich bottoms, overgrown with reeds, which make the best pasture in the world, the young reeds being preferable to sheaf oats. Here is great plenty of wild game of all kinds. Came this day about twenty-eight, or thirty miles.

11th. At day-break we set off, making our way through a thin woodland, interspersed with savannahs. I suffered extremely by reason of the excessive heat of the weather, and scarcity of water ; the little springs and runs being dried up. Travelled this day about thirty miles.

12th. We passed through some large savannahs and clear woods ; in the afternoon we came to the Ouabache ; then marched along it through a prodigious rich bottom, overgrown with reeds and wild hemp ; all this bottom is well watered, and an exceeding fine hunting ground. Came this day about thirty miles.

13th. About an hour before day we set out ; travelled through such bottoms as of yesterday, and through some large meadows, where no trees, for several miles together, are to be seen. Buffaloes, deer, and bears are here in great plenty. We travelled about twenty-six miles this day.

14th. The country we travelled through this day, appears the

same as described yesterday, excepting this afternoon's journey through wood land, to cut off a bend of the river. Came about twenty-seven miles this day.

15th. We set out very early, and about one o'clock came to the Ouabache, within six or seven miles of Port Vincent. On my arrival there, I found a village of about eighty or ninety French families settled on the east side of this river, being one of the finest situations that can be found. The country is level and clear, and the soil very rich, producing wheat and tobacco. I think the latter preferable to that of Maryland or Virginia. The French inhabitants hereabouts, are an idle, lazy people, a parcel of renegadoes from Canada, and are much worse than the Indians. They took a secret pleasure at our misfortunes, and the moment we arrived, they came to the Indians, exchanging trifles for their valuable plunder. As the savages took from me a considerable quantity of gold and silver in specie, the French traders extorted ten half johannes from them for one pound of vermillion. Here is likewise an Indian village of the Pyankeshaws, who were much displeased with the party that took me, telling them that "our and your chiefs are gone to make peace, and you have begun a war, for which our women and children will have reason to cry." From this post the Indians permitted me to write to the Commander, at Fort Chartres, but would not suffer me to write to any body else, (this I apprehend was a precaution of the French, lest their villany should be perceived too soon,) although the Indians had given me permission to write to Sir William Johnson and Fort Pitt on our march, before we arrived at this place. But immediately after our arrival they had a private council with the French, in which the Indians urged, (as they afterwards informed me,) that as the French had engaged them in so bad an affair, which was likely to bring a war on their nation, they now expected a proof of their promise and assistance. Then delivered the French a scalp and part of the plunder, and wanted to deliver some presents to the Pyankeshaws; but they refused to accept of any, and declared they would not be concerned in the affair. This last information I got from the Pyankeshaws, as I had been well acquainted with them several years before this time.

Port Vincent is a place of great consequence for trade, being a fine hunting country all along the Ouabache, and too far for

the Indians, which reside hereabouts, to go either to the Illinois, or elsewhere, to fetch their necessaries.

16th. We were obliged to stay here to get some little apparel made up for us, and to buy some horses for our journey to Ouicatonon, promising payment at Detroit, for we could not procure horses from the French for hire; though we were greatly fatigued, and our spirits much exhausted in our late march, they would lend us no assistance.

17th. At midday we set out; travelling the first five miles through a fine thick wood. We travelled eighteen miles this day, and encamped in a large, beautiful, well watered meadow.

18th and 19th. We travelled through a prodigious large meadow, called the Pyankeshaw's Hunting Ground: here is no wood to be seen, and the country appears like an ocean; the ground is exceedingly rich, and partly overgrown with wild hemp; the land, well watered, and full of buffaloe, deer, bears, and all kinds of wild game.

20th and 21st. We passed through some very large meadows, part of which belong to the Pyankeshaws on Vermilion River; the country and soil much the same as that we travelled over for these three days past; wild hemp grows here in abundance; the game very plenty: at any time, in half an hour we could kill as much as we wanted.

22d. We passed through part of the same meadow as mentioned yesterday; then came to a high woodland, and arrived at Vermilion River, so called from a fine red earth found here by the Indians, with which they paint themselves. About half a mile from the place where we crossed this river, there is a village of Pyankeshaws, distinguished by the addition of the name of the river. We then travelled about three hours, through a clear high woody country, but a deep and rich soil; then came to a meadow, where we encamped.

23d. Early in the morning we set out through a fine meadow, then some clear woods; in the afternoon came into a very large bottom on the Ouabache, within six miles of Ouicatanon; here I met several chiefs of the Kicapoos and Musquattimes, who spoke to their young men who had taken us, and reprimanded them severely for what they had done to me, after which they returned with us to their village, and delivered us all to their chiefs.

The distance from Port Vincent to Ouicatanon is two hundred and ten miles. This place is situated on the Ouabache. About fourteen French families are living in the fort, which stands on the north side of the river. The Kicapoos and Musquattimes, whose warriors had taken us, live nigh the fort, on the same side of the river, where they have two villages; and the Ouicatonons have a village on the south side of the river. At our arrival at this post, several of the Wawcottonans, (or Ouicatonans) with whom I had been formerly acquainted, came to visit me, and seemed greatly concerned at what had happened. They went immediately to the Kicapoos and Musquattimes, and charged them to take the greatest care of us, till their chiefs should arrive from the Illinois, where they were gone to meet me some time ago, and who were entirely ignorant of this affair, and said the French had spirited up this party to go and strike us.

The French have a very great influence over these Indians, and never fail in telling them many lies to the prejudice of his Majesty's interest, by making the English nation odious and hateful to them. I had the greatest difficulties in removing these prejudices. As these Indians are a weak, foolish, and credulous people, they are easily imposed on by a designing people, who have led them hitherto as they pleased. The French told them that as the southern Indians had for two years past made war on them, it must have been at the instigation of the English, who are a bad people. However I have been fortunate enough to remove their prejudice, and, in a great measure, their suspicions against the English. The country hereabouts is exceedingly pleasant, being open and clear for many miles; the soil very rich and well watered; all plants have a quick vegetation, and the climate very temperate through the winter. This post has always been a very considerable trading place. The great plenty of furs taken in this country, induced the French to establish this post, which was the first on the Ouabache, and by a very advantageous trade they have been richly recompensed for their labour.

On the south side of the Ouabache runs a high bank, in which are several fine coal mines, and behind this bank, is a very large meadow, clear for several miles. It is surprising what false information we have had respecting this country: some mention these spacious and beautiful meadows as large and barren savannahs. I apprehend it has been the artifice of the French to keep us igno-

rant of the country. These meadows bear fine wild grass, and wild hemp ten or twelve feet high, which, if properly manufactured, would prove as good, and answer all the purposes of the hemp we cultivate.

*July 25th.* We set out from this place (after settling all matters happily with the natives) for the Miames, and travelled the whole way through a fine, rich bottom, overgrown with wild hemp, alongside the Ouabache, till we came to Eel River, where we arrived the 27th. About six miles up this river is a small village of the Twightwee, situated on a very delightful spot of ground on the bank of the river. The Eel river heads near St. Joseph's, and runs nearly parallel to the Miames, and at some few miles distance from it, through a fine, pleasant country, and after a course of about one hundred and eighty miles empties itself into the Ouabache.

*28th, 29th, 30th and 31st.* We travelled still along side the Eel River, passing through fine clear woods, and some good meadows, though not so large as those we passed some days before. The country is more overgrown with woods, the soil is sufficiently rich, and well watered with springs.

*August 1st.* We arrived at the carrying place between the River Miames and the Ouabache, which is about nine miles long in dry seasons, but not above half that length in freshes. The head of the Ouabache is about forty miles from this place, and after a course of about seven hundred and sixty miles from the head spring, through one of the finest countries in the world, it empties itself into the Ohio. The navigation from hence to Ouicatanon, is very difficult in low water, on account of many rapids and rifts; but in freshes, which generally happen in the spring and fall, batteaux or canoes will pass, without difficulty, from here to Ouicatanon in three days, which is about two hundred and forty miles, and by land about two hundred and ten miles. From Ouicatanon to Port Vincent, and thence to the Ohio, batteaux and canoes may go at any season of the year. Throughout the whole course of the Ouabache the banks are pretty high, and in the river are a great many islands. Many shrubs and trees are found here unknown to us.

Within a mile of the Twightwee village, I was met by the chiefs of that nation, who received us very kindly. The most part of these Indians knew me, and conducted me to their village,

where they immediately hoisted an English flag that I had formerly given them at Fort Pitt. The next day they held a council, after which they gave me up all the English prisoners they had, then made several speeches, in all which they expressed the great pleasure it gave them, to see the unhappy differences which embroiled the several nations in a war with their brethren, the English, were now so near a happy conclusion, and that peace was established in their country.

The Twightwee village is situated on both sides of a river, called St. Joseph's. This river, where it falls into the Miame river, about a quarter of a mile from this place, is one hundred yards wide, on the east side of which stands a stockade fort, somewhat ruinous.

The Indian village consists of about forty or fifty cabins, besides nine or ten French houses, a runaway colony from Detroit, during the late Indian war ; they were concerned in it, and being afraid of punishment, came to this post, where ever since they have spirited up the Indians against the English. All the French residing here are a lazy, indolent people, fond of breeding mischief, and spiriting up the Indians against the English, and should by no means be suffered to remain here. The country is pleasant, the soil rich and well watered. After several conferences with these Indians and their delivering me up all the English prisoners they had,—

On the 6th of August we set out for Detroit, down the Miames river in a canoe. This river heads about ten miles from hence. The river is not navigable till you come to the place where the river St. Joseph joins it, and makes a considerable large stream, nevertheless we found a great deal of difficulty in getting our canoe over shoals, as the waters at this season were very low. The banks of the river are high, and the country overgrown with lofty timber of various kinds ; the land is level, and the woods clear. About ninety miles from the Miames or Twightwee, we came to where a large river, that heads in a large lick, falls into the Miame river ; this they call the Forks. The Ottawas claim this country, and hunt here, where game is very plenty. From hence we proceeded to the Ottawa village. This nation formerly lived at Detroit, but is now settled here, on account of the richness of the country, where game is always to be found in plenty. Here we were obliged to get out of our

canoes, and drag them eighteen miles, on account of the rifts which interrupt the navigation. At the end of these rifts, we came to a village of the Wyondotts, who received us very kindly; and from thence we proceeded to the mouth of this river, where it falls into Lake Erie. From the Miames to the lake is computed one hundred and eighty miles, and from the entrance of the river into the lake to Detroit, is sixty miles; that is, forty-two miles upon the lake, and eighteen miles up the Detroit river to the garrison of that name. The land on the lake side is low and flat. We passed several large rivers and bays, and on the 16th of August, in the afternoon, we arrived at Detroit river. The country here is much higher than on the lake side; the river is about nine hundred yards wide, and the current runs very strong. There are several fine and large islands in this river, one of which is nine miles long; its banks high, and the soil very good.

17th. In the morning we arrived at the fort, which is a large stockade, inclosing about eighty houses, it stands close on the north side of the river, on a high bank, commands a very pleasant prospect for nine miles above; and nine miles below the fort; the country is thick settled with French, their plantations are generally laid out about three or four acres in breadth on the river, and eighty acres in depth; the soil is good, producing plenty of grain. All the people here are generally poor wretches, and consist of three or four hundred French families, a lazy, idle people, depending chiefly on the savages for their subsistence; though the land, with little labour, produces plenty of grain, they scarcely raise as much as will supply their wants, in imitation of the Indians, whose manners and customs they have entirely adopted, and cannot subsist without them. The men, women, and children speak the Indian tongue perfectly well. In the last Indian war the most part of the French were concerned in it, (although the whole settlement had taken the oath of allegiance to his Britannic Majesty) they have, therefore, great reason to be thankful to the English clemency in not bringing them to deserved punishment. Before the late Indian war there resided three nations of Indians at this place: the Putawatimes, whose village was on the west side of the river, about one mile below the fort; the Ottawas, on the east side, about three miles above the fort; and the Wyondotts, whose village lays on the

east side, about two miles below the fort. The former two nations have removed to a considerable distance, and the latter still remain where they were, and are remarkable for their good sense and hospitality. They have a particular attachment to the Roman Catholic religion, the French, by their priests, having taken uncommon pains to instruct them.

During my stay here, I held frequent conferences with the different nations of Indians assembled at this place, with whom I settled matters to their general satisfaction.

*September 26th.* Set out from Detroit for Niagara; passed Lake Erie along the north shore in a birch canoe, and arrived the 8th of October at Niagara. The navigation of the lake is dangerous for batteaux or canoes, by reason the lake is very shallow for a considerable distance from the shore. The bank, for several miles, high and steep, and affords a harbour for a single batteau. The lands in general, between Detroit and Niagara, are high, and the soil good, with several fine rivers falling into the lake. The distance from Detroit to Niagara is computed three hundred miles.

*A List of the different Nations and Tribes of Indians in the Northern District of North America, with the number of their fighting Men.*

<i>Names of the Tribes.</i>	<i>Nos.</i>	<i>Their Dwelling Ground.</i>	<i>Their Hunting Ground.</i>
Mohocks, <i>a</i> .....	160	Mohock River.	Between that and Lake George.
Oneidas, <i>b</i> .....	300	East side of Oneida Lake, and on the head waters of the east branch of Susquehannah.	In the country where they live.
Tuscaroras, <i>b</i> .....	200	Between the Oneidas and Onandagoes.	Between Oneida Lake and Lake Ontario.
Onandagoes, <i>b</i> .....	260	Near the Onandago Lake.	Between Onandago lake and mouth of Seneca River, near Oswego.
Cayugas, <i>b</i> .....	200	On two small Lakes, called the Ca-yugas, on the north branch of Susquehannah.	Where they reside.
Senecas, <i>b</i> .....	1000	Seneca Country, on the waters of Susquehannah, the waters of Lake Ontario, and on the heads of Ohio River.	Their chief hunting country thereabouts.
Aughquagas, <i>c</i> .....	150	East branch of Susquehannah River, and on Aughquaga.	Where they live.
Nanticokes, <i>c</i> .....	100	Utsanango, Chaghmett, Oswego, and on the east branch of Susquehannah.	Do.
Mohickons, <i>c</i> .....	100		
Conoys, <i>c</i> .....	30		
Monsays, <i>c</i> .....	150	At Diahogo, and other villages up the north branch of Susquehannah.	Do.
Sapoones, <i>c</i> .....	30		
Delawares, <i>c</i> .....	150		

*a* These are the oldest Tribe of the Confederacy of the Six Nations.

*b* Connected with New York, part of the Confederacy with New York.

*c* Connected with, and depending on the Five Nations.

<i>Names of the Tribes.</i>	<i>Nos.</i>	<i>Their Dwelling Ground.</i>	<i>Their Hunting Ground.</i>
Delawares, <i>d</i> .....	600	Between the Ohio and Lake Erie, on the branches of Beaver Creek, Muskingum, and Guyehugo.	Where they live.
Shawnesse, <i>d</i> .....	300	On Scioto, & branch of Muskingum.	Do.
Mohickone, <i>d</i> .....	300	In Villages near Sandusky.	On the head banks of Scioto.
Coghnawages, <i>d</i> .....			On the ground where they reside.
Twightwees, <i>e</i> .....	250	Miame River, near Fort Miame.	Between Ouitanon and the Miames.
Wayougtanies, <i>f</i> .....	300	On the branches of Ouabache, near Fort Ouitanon.	About Lake Erie.
Pyankeshas, <i>f</i> .....	300	Near the French Settlements, in the Illinois Country.	
Shockays, <i>f</i> .....	200	Near Fort Detroit.	
Huskhuskeys, <i>g</i> .....	300	On Saganna Creek, which empties into Lake Huron.	Thereabouts.
Illinois, <i>g</i> .....	300	Near Michilimachinac.	On the north side of Lake Huron.
Wayondotts, <i>h</i> .....	250	Near the entrance of Lake Superior, and not far from Fort St. Marys.	Thereabouts.
Ottawas, <i>h</i> .....	400	Near Fort LaBay on the Lake Michigan.	Their hunting ground is thereabouts.
Putawatimes, <i>h</i> .....	150	Near Fort St. Joseph's.	Thereabouts.
Chepawas, <i>k</i> .....	200	On Lake Michigan and between it and the Mississippi.	Where they respectively reside.
Mynonamies, <i>k</i> .....	550		
Shockeys, <i>k</i> .....			
Putawatimes, <i>k</i> .....	150		
Ottawas, <i>k</i> .....	150		
Kicapoos, <i>l</i> .....			
Outtagamies, <i>l</i> .....			
Musquatans <i>l</i> .....			
Miscotins, <i>l</i> .....	4000		
Outtamacks, <i>l</i> .....			
Musquakeys, <i>l</i> .....			
Oswegatches, <i>h</i> .....	100	Settled at Swagatchy in Canada, on the River St. Lawrence.	Thereabouts.
Connedesagoes, <i>k</i> .....	300	Near Montreal.	
Coghnewagoes, <i>k</i> .....			
Orondocks, <i>k</i> .....	100	Settled near Trois Riviers.	
Abonakies, <i>k</i> .....	150		
Alagonkins, <i>k</i> .....	100		
La Suii, <sup>†</sup> .....	10,000	South-west of Lake Superior	

*d* Dependent on the Six Nations, and connected with Pennsylvania.

*e* Connected with Pennsylvania.

*f* Connected with the Twightwees.

*g* These two Nations the English had never any trade, or connection with.

*h* Connected formerly with the French.

*i* Connected with the Indians about Detroit, and dependent on the commanding officer.

*j* Always connected with the French.

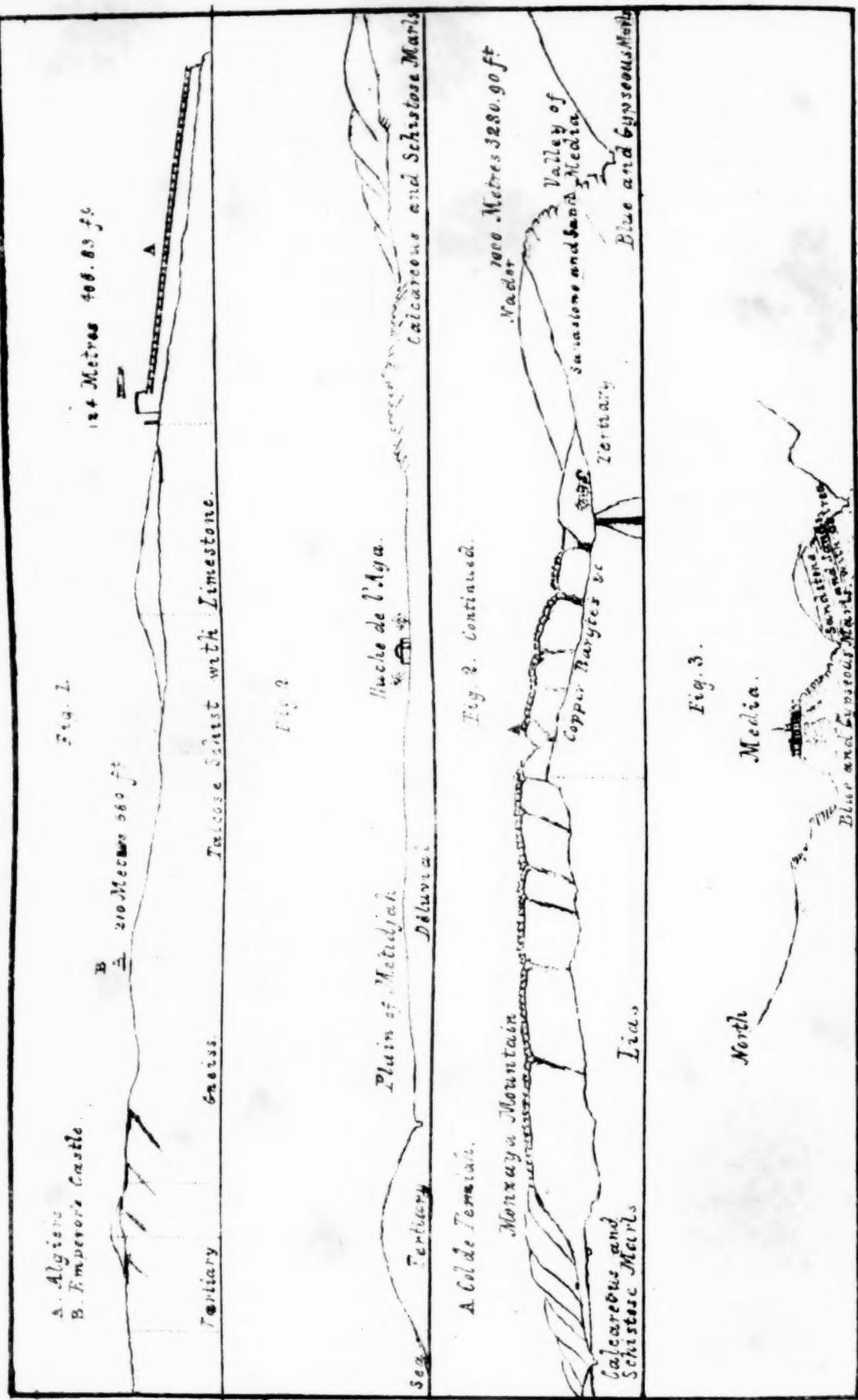
*k* Connected with the French.

*l* Never connected in any trade or otherwise with the English.

\*There are several villages of Chapawas settled along the bank of Lake Superior, but as I have no knowledge of that country, cannot ascertain their numbers.

<sup>†</sup> These are a nation of Indians settled south-west of Lake Superior, called by the French La Sue ; who, by the best account that I could ever get from the French and Indians, are computed ten thousand fighting men. They spread over a large tract of country, and have forty odd villages ; in which country are several other tribes of Indians, who are tributaries to the Lasues, none of whom, except a very few, have ever known the use of fire-arms ; as yet but two villages. I suppose the French don't choose to risk a trade among such a powerful body of people, at so vast a distance.





GEOLOGICAL NOTICES OF BARBARY.

Abstract of M. ROZET's Geological Notices of Barbary, originally published in the "Journal de Geologie," for September, December, 1830, and January 1831.

OUR object being to lay before our readers that kind of transatlantic information which is most curious in itself, and which is the least likely to be within their reach, we have thought they would be pleased with an account of the geology of that part of Barbary which the conquest of Algiers by the French, has made known. M. Rozet is a distinguished geologist, and is one of the joint editors, with M. A. Boue, and Jobert, of the "Journal de Geologie." The French government, which omits no opportunity to cherish science, when it sent the expedition to Africa, gave M. Rozet an appointment as Geographical Engineer, that every advantage might be taken of the expedition, in favour of geological science. M. Rozet has sent some very interesting memoirs on this subject to France, from the three first of which we have made the following abstracts, and have accompanied them with M. Rozet's sections.

ED.

M. Rozet, after saying that the French army landed 14th June, 1830, states, that "Algiers is built on a talcose schist, like that on the French coast at Toulon, and is traversed in its mass by veins of white quartz; that it passes in the upper part into mica schist; contains beds of white feldspar, subordinate masses of grey sub-lamellar, stratified lime stone, more than 100 metres thick, (328 feet English)—the strata thin, and separated by partings of talcose or micaceous schist, beautiful pyrites of copper in the mass. Near the suburbs of Babaloued there are some beds of white marble, worked for public buildings. This schistose groupe exceeds 500 metres in thickness (1640 feet.) The strata are irregular, and dip to the south, at an angle of from  $20^{\circ}$  to  $45^{\circ}$ . The mountains are 400 metres (1312 feet) above the level of the sea. (Mt. Banjareah.) The tops of these hills are rounded, and their sides very steep. They are separated from each other by deep valleys, through which small rivulets flow. The inhabited part of the country presents a magnificent vegetation; forests of orange, fig, and olive trees, separated by majestic palm trees, and tall hedges of the agave or aloe. This schistose formation is well developed around Algiers; at the east it rises to the summit of Mount Banjareah, and stretches along the coast

at least as far as Cape Corinna. The fort of Twenty-four hours, and all the buildings of the mole, stand upon the grey limestone. About the mole the beds dip to the east. The gneiss forms a somewhat narrow belt, stretching from east to west. It leaves the sea-shore in front of fort Babazoum, passes to the emperor's castle, and the mountains which command that fortress, and is lost to the south under the tertiary deposits. M. Rozet remarks, that this gneiss which has all the characters of a primitive rock, *reposes upon talcose schists, which appear to belong to the transition;* but that the veins of mica schist passing through the gneiss, prove this last to be the oldest rock, although it covers the talcose schists which pass into mica slate. We leave the French geologists to reconcile this unconformable condition of gneiss to the modern opinions concerning transition.

The gneiss dips to the south, under the tertiary, a calcaire grossier, (London clay), or a grès calcaire, (calcareous sandstone,) passing into a pudding stone, resembling the calcaire moellon of Montpelier. These calcareous beds, like the gneiss, on which they repose, dip to the south. They pass occasionally into compact limestone, (at Staoueli) containing limnea and helices, together with marine shells. In other places, M. Rozet found large flat oysters, and large pectens, resembling those which characterize the beds in Provence. The tertiary abounds along the coast, from the Swedish consulate to El Aratch, with well preserved pectens, large oysters, and some terebratulæ. The tertiary is covered with diluvial soil, but in no part had fossil bones of quadrupeds been found. The tertiary formation is thought to cover a surface of country of twenty square leagues. The table lands, the plains, and the bottoms of the valleys, are covered with diluvial soil, resembling that of France. The superficial part is formed of a red or yellowish marl; beneath it is a mass of marl and rolled pebbles, all derived from the neighbouring mountains. On the narrow plain to the east and west of Algiers, the diluvial soil is more than ten metres (32 feet) thick, with some boulders. M. Rozet finds a strong analogy between the geological phenomena of the opposite coasts of the Mediterranean.

*Geological Notice of the country traversed by the French army, in the expedition of Media.*

To punish the Bey of Titery for his treason, General Clauseel resolved to seek him out in the middle of the Atlas. The army

left Algiers the 17th November, traversing the tertiary hills before mentioned, on its way to the plain of Metidjah,\* and directing its route towards the south-west, on the road to Bleidah. The plain was covered throughout with diluvial soil, lying in undisturbed horizontal layers, about  $13\frac{1}{2}$  feet thick, but in the bed of the Chieffa, at the foot of the Atlas, it was about 33 feet thick. The Metidjah is almost uninhabited, and nearly uncultivated, except where it joins the Atlas; there the town of Bleidah is charmingly situated, and almost surrounded with magnificent gardens of orange trees. The chain of the little Atlas is here at its greatest elevation, rising to more than 1200 metres, (3937 feet;) the valleys are deep and narrow, and the mountains covered with woods. These mountains are formed of the same rocks as those of Banjareah, near Algiers, with the strata dipping to the south: they present the same aspect as far west as the great farm of Huche de l'Aga; here the aspect of the mountains changes, they lower rapidly to the west, the planes have a less inclination, the vegetation is not as fine, and a change in the soil is announced. The first rock that occurred on the Atlas was a greyish black limestone, of a conehoidal fracture, passing into a marly and schistose limestone, and alternately with schistose marls, in the manner of the lias. The general inclination of the beds is to the south, at an angle varying from 10 to  $40^{\circ}$ , for the hills and tables, and which in the great escarpments rose to  $70^{\circ}$ . The stratification is often disturbed, but no volcanic rocks. This formation is poor in fossils, some broken pectens and ostrea, but no gryphaea, ammonites, or belemnites. The schistose marls contain small bivalves, (*possidonia*) which in Europe are characteristic of the lias. An hour before arriving at the Col de Temiah,† which is on the dividing water line, the mass is almost altogether marly, the limestone becoming subordinate. The Col de Temiah has been hollowed out of these marls; the general dip is to the south. The strata south of the Col are cut by veins, almost vertical, of carbonated iron, and laminar sulphated barytes, mixed with grey copper, malachite, and a little blue carbonate. These veins are exposed about eighty metres, (262 feet) and the copper might be worked to advantage. Calcareous and schistose marls, and the laminar barytes, occur in like manner in Provence, Burgundy, and Ardennes, and M. Rozet considers them true equiva-

\* Pl. 7. Fig. 2.

† Pl. 7. Fig. 2, continued.

lents. This formation constitutes mountains 1100 metres (3609 feet) above the level of the sea, with few escarpments, although a talus is generally to be observed. The timber is oak and cork. There are no fruit trees in the Atlas, and the olive is only found as far as Media. After passing the Col de Temiah, the road is extremely difficult, with scarce room for two to pass abreast; and after a march of an hour and a half, the army came to the foot of the chain, upon a small narrow table land, perfectly smooth. A new change in the beds appeared here, the hills were closed in by the sub-appenine formation. At the foot of the chain, the hills which abut upon the lias, are entirely composed of an argillaceous blueish marl, not schistose like that of the north; about 100 metres thick, (328 feet) and no appearance of stratification. It contains gypsum, which furnishes plaster for the buildings at Media, Pectens, Pectunculi; and an immense quantity of that murex, which is characteristic of the calcareous moellon of Provence, is found in a yellow ferruginous sand stone, alternating with ferruginous sand, at the upper part of the hills. As far as Media, three leagues south-east from the Atlas, and a league further to the south, M. Rozet found the tertiary formation occurring in like manner. The town of Media\* occupies the summit of a hill, situated upon the north flank of a great valley, which runs nearly from east to west. Section No. 2, terminates at this valley, and No. 3, made about three miles east of it, traverses the same valley, and shows the details of the sub-atlantic tertiary. This formation constitutes hills and small mountains, some of which are 1000 metres, or 3280 feet above the level of the sea, and is entirely identical with that of those hills, which, stretching along the coast from Cape Matifon to Cherchel, border the plain of Metidjah to the north; so that this tertiary has been deposited on each slope of the little Atlas, but not in the interior of the chain. M. Rozet concludes this interesting paper, by showing that the beds of the lias being highly inclined, and the tertiary deposits abutting horizontally against them, the chain of the little Atlas was necessarily raised before the deposit of these last.

In a subsequent paper, M. Rozet further shows that to the north of Metidjah, the hills which extend from Cape Matifou to beyond Kubber Romèrh, are formed of sub-atlantic tertiary, of the same character as that south of the little Atlas. Blue marl,

\* Pl. 7. Fig. 3.

covered by sandstone, (grès) alternating with sand, the sandstones containing the same shells with the calcaire moellon of Provence. He had found belemnites in the supposed lias. He concludes by stating that the groupe of talcose schists is the inferior floor of the provinces of Algiers and Titery; that the tertiaries have been deposited posterior to the elevation of the schists, and that certain trachytic porphyrys, near the ancient Rustonium, about six leagues from Algiers, did not make their appearance until after the deposit of the tertiaries."

Our geological readers will be struck with the importance of the remarkable agreement of the entire formations, of the opposite coasts of the Mediterranean, as well as with the equivalent tertiaries south of the little Atlas; all of which facts occasion many curious reflections concerning the ancient geological state of that part of the world.

In concluding this abstract, we would point to the especial interest which these notices of M. Rozet will in future create, when it is known that the principal geological circumstances which he has so clearly made out on the coast, and in the interior of the province of Algiers, are, with the exception of the Atlas chain, repeated on our Atlantic coast; where we have the primary rocks stretching from New York to Florida, with occasional deposits of blue marl, covered with sandstone and ferruginous sand, as at Mullica Hall, Tinton Falls near Long Branch in New Jersey, and many other places, the secondary character of these is well made out by belemnites, crocodiles, saurians, &c.—and they are again superimposed by acknowledged tertiaries, in New Jersey, Delaware, and especially in Maryland and further south, to the total exclusion of the great calcareous deposits connected with coal, and the numerous beds of the oolitic series and chalk formation. We hope, ere long, to be in a situation to enter systematically upon the geology of this country; but we perceive more and more forcibly the necessity of raising up a school, and of rallying practical geologists here, before we can look for such contributions and aid, as the important task before us demands.

## BONES IN CAVES, &amp;c.

Extract of a letter from the REV. DR. BUCKLAND to the Editor, dated Aug. 23, 1831.

"I HAVE, not long since, had in my custody a fine meteoric stone about four pounds weight, that fell in Oxfordshire at Launton, near Bicester, in the spring of 1830; it is the property of Dr. Lee of Aylesbury. An account of it has been published in Loudon's Magazine of Natural History for March last. Since that time a piece of it has been examined by Farraday, *and found to contain chromium, as usual.* [This was doubted.]

"My expedition to Llandilo was in consequence of a report I received from W. Long Wrey, Esq., who resides at Llandebie, near Llandilo, stating that he had found a cave containing human bones mixed with those of other animals. This is the cave mentioned in my Reliquiae,\* and on my arrival I found, as I had expected, that the bones are of two distinct æras. First, at the top, and enveloped in stalagmite, were the human remains—probably of Celtic inhabitants that used this cave as a place of sepulture. Second, between the stalagmite, in diluvial sand and mud, the bones of bears, elks, and smaller deer, in the usual state of cave bones, just like those at Torquay. I saw none that had been gnawed, and too few of them had been collected to enable me to say whether it was a den or pitfall; and the deposit was so buried under the rubbish of the lime burners, that it was impossible to examine further, until the lime burning ceases, which will be in the autumn, when Mr. Wrey will again proceed to search. The whole of the rock that covered over the spot in which these human skeletons lay, has been removed.

"I have just received intelligence of the arrival in London of five cases of bones for me, from the cave at Wellington valley, collected by Mr. Henderson, (a surgeon) for Col. Dumaresque, who has forwarded them to me. I have not yet seen them, but am anxious to compare them with those sent to the Geological Society by Major Mitchell: the abstract published in the pro-

\* "The other case occurred in 1810, at Llandebie, in Caermarthenshire, where a square cave was suddenly broken into, in working a quarry of solid mountain limestone, on the north border of the great coal basin. In this cave lay about a dozen human skeletons in two rows, at right angles to each other. The passage leading to this cave had been entirely closed up with stones for the purpose of concealment, and its mouth was completely grown over with grass.—Reliquiae Diluvianæ, 2d ed. p. 166.

ceedings of the Geological Society, gives the whole sum and substance of the paper which he sent to the society, in which no theory is offered to explain their origin. In the account published in Jameson's Journal,\* it was stated to be a cave like Kirkdale, of accumulation by the agency of beasts of prey. I do not concur in this opinion ; there were no gnawed bones in the whole collection, and the mass was not collected in a horizontal cave, but in a great fissure, *into which I conceive the animals have tumbled during successive generations.* The position of the bones in the vertical fissure shows it never could have been a den ; they lie in heaps amid angular blocks fallen from the sides of the fissure, and mixed with stalagmite, and red earthy incrustations, forming a cement, such as rains and trickling water may have introduced. There is no sign of violent igneous action, no rolled pebbles, no fragments of any distant rock, and in one case several bones of a carpus, adhering together by stalagmite : these have clearly been submitted to no violent agitation by water; but as the exact circumstances in which this specimen was found are not mentioned, it is possible this carpus may be derived from one of the most recently introduced animals. I have no doubt the fissure has thus been supplied with bones by animals falling into it, as in the Mediterranean fissures. There is no evidence to show that there is in it any accumulation of diluvium. Mr. Pentland is positive that the large bone found high up near the top of the deposit, is the bone of an elephant; and Mr. Clift is equally positive as to the tusk fixed in the anterior part of the jaw of a dugong. These are strange bed-fellows for kangaroos, wombats, and the *genus omne* of present inhabitants of New Holland. The place of the elephant's bone is known from the fact of a rope having been tied to it, to let down the persons who were descend-

\* In the account given to Dr. Jameson by Dr. Lang of Sydney, and which was published in the ed. N. Phil. Jour. for March, 1831, the bones are stated to have been found "in a third chamber, generally broken, some strewed on the floor of the cave, &c." From the various accounts published on this subject, we also fell into the opinion that this was a den which was not a stranger to a diluvial action of great extent. If these repositories of bones of the present races of animals found in New Holland, are, as Dr. Buckland supposes, extensive fissures, into which these bones have accidentally come, we have yet, thanks to the elephant and the dugong, two pretty good bones to gnaw. In Mr. Clift's report, that which Mr. Pentland—who studied with Cuvier—supposes to have belonged to an elephant, is said to bear a great resemblance to the *radius* of a hippopotamus.

ing to a lower part of the fissure where bones were most abundant. There are also in one part of the cavity, transverse plates of stalagmite enveloping bones, and separated by a thin parting of red earth, which shows the process of accumulation to have been gradual, in this part at least. There is also at the geological society a large dentata, sent from New Holland, from near Sidney, and said to have been found, not in a cave, but near the surface of the land. It is about the size of the dentata of a rhinoceros, but is not exactly like that animal's vertebra : it remains yet to be identified.

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## SCIENTIFIC MEETINGS.

*Meeting of the Cultivators of Natural Science and Medicine, at Hamburg,  
in September, 1830.*

In the April number, for 1831, of Dr. Brewster's valuable work, the Edinburgh Journal of Science, is a very interesting and lively account, by Mr. Johnston, of the meeting of naturalists at Hamburg, in September, 1830. These German conventions of learned men, who cultivate the natural sciences, owe their origin to Professor Oken of Munich, a distinguished naturalist and author, and Editor of the Isis, a monthly periodical, commenced at Jena, in 1817, and devoted to literature and science. It was in the Isis that Oken first proposed these annual meetings of naturalists; but it was a time when the German courts kept a surveillance over periodical literature, and the proposition coming from him, was not sufficiently favoured. By the introduction of some political articles into his Journal, he had formerly given offence, his Professor's chair of natural history at Jena was taken from him, and the Isis forbidden to be published in Weimar. In 1827, however, the King of Bavaria presented him with a chair in the university of Munich, where he is now Professor of Physiology. The first meeting took place at Leipsic, in 1822. It consisted of about a dozen strangers, and twenty inhabitants. In 1823 they met in greater force at Halle. In 1824 at Wurtzburg. The accession this year both in numbers and talent was marked; and from this time credit seems to have been given to them for the real objects they had in view, which were not only to promote a friendly personal intercourse among men of science, but

to draw public attention to science, and to excite governments to examine into the condition of their scientific institutions, and to seek for men of science competent to fill the chairs of public instruction. At Frankfort, in 1825, they were most honourably received. The inhabitants of this town, which has no university, vied with each other in the hospitable attentions they paid to their distinguished visitors. At Dresden, in 1826, they had also a very friendly reception. In 1827, Munich received them, but we shall give Mr. Johnston's words.

"The sixth meeting, in 1827, was held at Munich, the seat of a flourishing university, opened only the preceding year under the favouring auspices of Louis Maximilian of Bavaria. This city also deserves well of the society, and the attentions of the king was such as it had not hitherto experienced. Besides general attention to the comfort and accommodation of the whole body, particular attentions were paid to the individual members; and each person, during the period of his stay, had an invitation to dine at least once in the palace. They now began to reckon their number by hundreds; and the amount and variety of subjects brought forward at their public meetings having increased beyond expectation, it was found necessary to break themselves up into sections, of which the botanists, an amiable and enthusiastic race of men, first set the example. Thus time was gained; men of like tastes and pursuits brought more frequently and more closely together; and every one spared the infliction of dissertations and discussions upon the thousand and one subjects in which he felt no earthly interest: for, though all cultivators of natural science rejoice in the advancement, and admire those who successfully cultivate any one department, yet each one has his own favourite branch or branches, beyond which he has little anxiety to roam, and unconnected with which, discussions, however learned, are often only tiresome. It was a judicious plan, then, to make the separation into sections, and thus to permit the *shell* and *fly* men to discuss the mysteries of their several *ologies*, without scandalizing the more grave and weighty pursuits of medicine and oryctognosy. This practice, begun at Munich, assumed a more extended and definite form at Berlin, and was finally arranged and consolidated at Heidelberg."

But the most splendid meeting was at Berlin in 1828. The number of strangers from Germany and the northern countries amounted to two hundred and sixty-nine, for whom lodgings were provided in good and convenient situations, gratis. Humboldt presided, and the king and the royal family graced, with their presence, some of the entertainments given to them. The distinguished reception the meeting received in this scientific capital, raised the *Deutscher Naturforscher Versammlung* to the

highest credit. In 1829, the beautiful and romantic city of Heidelberg received the convention, and in 1830, Hamburg.

"It has now become a matter of debate among the cities of Germany, which shall have the honour of receiving the society at their anniversary. To have the smallest chance, the city desirous of the honour must either be represented by a deputation of members attending the meeting, or must otherwise express to the society through its president, its desires, its claims, and the efforts it will make for general accommodation."

It seems that some of the worthy Burgomasters of Hamburg, and a great many more of their constituents, did not comprehend very clearly what all these queer mortals calling themselves *Naturforscher*, or investigators of nature, wanted in their old town. Nobody could make out that they desired to buy any thing, and not one of them had been seen with any thing that was worth buying; and as buying and selling constituted, in their eyes, the great ends of existence, they took it for granted that the presence of these gifted individuals, would be of no great advantage to them, especially, seeing it was generally understood they were to be fed at the public expense.

"You might hear the matter discussed over a shipping list, or a newspaper, in the Boursen Hall; over a sample of coffee, probably on the exchange, or a beef steak in a restaurateurs. 'So many men come together to see one another, come so far merely to look at one another—nonsense!' And then, said another, as he took up the thread of the affair, 'They say we are to feed them; but if the Senate spend our money in that way, the town will be about their ears. When you or I go a travelling on our affairs to a strange place, nobody will think of treating us, and why should we treat these *Naturforscher*, as they call themselves?' But the judicious and thinking men, though they did not pretend to understand all the objects of the meeting, thought, generally, that these strangers, being once within the walls, it would be for their own credit to use them well for a few days, when they would soon be off again."

And extremely well they were treated, as Mr. Johnston has abundantly shown.

The most distinguished members present upon this occasion, were Berzelius of Stockholm. Pfaff and Wiedeman from Kiel. This last is a celebrated accoucheur, and performed the Cesarean operation twice upon the same individual. He and Pfaff are the pride of the university of Kiel. The last is a profound naturalist, has an extremely lively mind, with a somewhat liberal inclination in politics.

"Travelling in Prussia some years ago, when secret societies were the order of the day, and the German governments in great alarm, he talked, as usual, more freely and boldly than was encouraged in that country. The Prussian government was offended, and Pfaff having got safe home, the Prussian ambassador at Copenhagen was charged to make a remonstrance on the subject; but the king paid no attention, and his ministers, therefore, could give the ambassador no satisfaction. Determined on pushing the affair, the ambassador had an audience of the king, and signified that the Prussian government expected Pfaff should be punished. 'Oh,' said the king, '*Pfaff is my very good friend, he has only been a little distract; he has fancied he was in his own country, where he might say any thing.*' A terrible satire, coming as it did from the most absolute monarch in Europe."

Amongst the others were Lichtenstein and Encke from Berlin, with the celebrated Oersted from Copenhagen. Professor Fischer of the Botanic Garden of St. Petersburg, and Fischer the Zoolologist and President of the Academy of Sciences of Moscow, not the *vegetable*, but the *animal* Fischer, as he wittily told Mr. Johnston when presented. Struve, eminent in astronomy, from Dorpat; Oken from Munich; Dr. Schmeisser of Hamburgh, lecturer on chemistry, and an old friend and pupil of the celebrated Dr. Black, was prevented from attending the meeting by ill health, but Mr. Johnston has preserved some of his lively sayings, and amongst the rest the following pun of Blumenbach.

"And he told [Schmeisser] with much glee, how, when the method had become newly known, he formed a quantity of artifical *spermaceti* from some half decayed muscles by means of nitric acid, and making it into candles, sent some of them to Blumenbach, with the notice that they were prepared from the legs of a man, who in his life time had done no good, and how Blumenbach punningly replied to him, '*Mortui lucent qui in vita obscuri fuerunt.*'"

There were only two or three individuals from England, and America was represented by Dr. Jamieson of Baltimore. The *Naturforchers* dined in public; from five hundred to six hundred individuals assembled, including the wives and sisters of members. Notwithstanding the presence of the ladies, it seems the noise and confusion, the running about, and the scrambling for places, were perfectly intolerable. An attempt however was made to drown the noise by the introduction of music, vocal and instrumental, which in some degree succeeded.

The opening of the session commenced on the 18th September, by the delivery of an inaugural discourse from the President Bartels. The secretary then read the laws of the society. From

these it appears, every person, without election, is a member, who has written upon natural science or medicine : that a majority of voices decide every thing ; that the place of meeting shall be variable, and be determined at each anniversary for the ensuing year. One of the laws is, that the society shall form no collections, and, except its records, possess no property. Whatever is laid before them, shall be again withdrawn by its owner. Another is, that the expenses of the meeting shall be defrayed by the contributions of the members present.

These preliminaries being gone through, Professor Struve delivered a long oration on the history, importance, and present state of astronomy. After magnifying astronomy beyond all conceivable studies, he decided that Germany, of all the countries of Europe, held the highest rank in this branch, Russia next, then England and Italy, and France last of all. The discourse is thought to have savoured of self-adulation, and not to have been well received. When the business of the first public sitting was closed, the members retired to form themselves into sections, and to choose their presidents.

These sections, or committees, appear to have proceeded smoothly, with the following exception :

" On reading his report of the proceedings of the zoological section, Professor Luckart took occasion to animadvert, in a few ill natured words, on the appointment of Englishmen to preside in that section. ' It is the first time,' said he, ' that a foreigner, who did not understand the language, has been appointed to preside at a meeting of German naturalists.' "

This was felt to be bad taste, and worse feeling, by all present ; for this section had agreed to name a daily president, and in this way Mr. Gray, and Dr. Traill, had each been honoured with the chair. A Dr. Siemers, who followed him, by his judicious conduct made amends for this breach of good manners.

The hours not devoted to science, were most agreeably filled up by parties of pleasure to the neighbouring gardens, to the island of Heiligoland, to the theatres, and to evening re-unions of a very agreeable kind, amongst the most distinguished naturalists. On the 25th, the last day of the convention, the whole affair was finished off by a splendid ball, at which all the beauty of Hamburg assisted.

We have been exceedingly pleased with every part of Mr. Johnston's narrative of this interesting meeting, with one excep-

tion, where, in ranging himself on the liberal side of the question, he does not appear with his accustomed liberality. It is where he attributes to the governments of the German States, an improper control over these interesting meetings, whilst it is evident to every one, that they are especially encouraged and protected by the very governments he hints at. The insinuations too, that Prince Metternicht discourages them, contrary to the wish of the Emperor, appear to be brought forward merely to support a bad pun, ‘à la milady Morgan,’ upon the Prince’s name.—“Il est comme un Roi ce Mitternacht,” said a Halle man to me.

We do not presume to express any opinion upon the manner in which Prince Metternicht may discharge his duty to his sovereign, but we are not ignorant of Germany, and do not believe a word of the allegation brought—we believe without consideration,—against this distinguished personage, who is one of the best informed men in Europe, and whose taste and attainments in natural science, have, we venture to predict, insured all honour and protection to the Naturforscher, in their past session, which was to take place at Vienna in September last, under the very eye of the Prince. A valued friend of ours, whose name is at this time pre-eminently conspicuous in Europe in geological science, in a letter from Vienna, says, “*I met Prince Metternich at dinner, at Lord Cowley’s, and had a tête à tête with him on geology : I found him quite au courant, and certainly a most accomplished and universal man.*” Such testimony as this, which accords with what we have otherwise heard of this great statesman, makes us turn a deaf ear to such ill founded suspicions of his being unfriendly to the cause of natural history. With this single exception, we repeat, that we have been highly pleased with Mr. Johnston’s narrative, which has, in no small degree, made us desirous of receiving the earliest intelligence of the meeting at Vienna.

That a society of this kind, constituted by delegates from all the branches of science, should be imitated in other countries, was to be expected, and especially in England. Annual meetings of this nature, unless attended by eminent men, would sink into insignificance, and Germany is too extensive a country, its principal cities too far separated from each other, to admit of the most eminent men annually leaving their homes and pursuits, upon a visit to a distant country. It is probable, that ere long,

**Germany, England, Scandinavia, Italy and France** will each have their separate conventions; and if they are held at convenient seasons, a few individuals, ardent in the pursuit of knowledge, and blessed with leisure and wealth, may visit them all, and thus get annually a panoramic view of the progress of universal philosophical theory. If an abstract of the proceedings of such meetings were published, after the manner of the proceedings of the Geological Society of London, this indeed would be a highly intellectual age.

We shall hope soon to lay before our readers an account of the "Proposed general Scientific Meeting at York." The following circular was forwarded to us some time ago.

*Proposed general Scientific Meeting at York, England, to be held  
September 26, 1831.*

A strong desire having been expressed that a meeting of friends of science should take place annually, in some central town in England, with the view of promoting unrestrained communication of scientific opinions and discoveries; notice is hereby given, that a committee of the principal scientific societies of London, Edinburgh, &c., have fixed on the city of York as a most desirable place for the first meeting;—to commence on Monday, the 26th of September, a period of the year which has been ascertained to be most convenient for the parties interested, and the meeting to be continued during as many days as may be deemed expedient.

Any friends of science in Great Britain, or in any other parts of Europe, who may wish to attend this meeting, are requested to send a letter (post paid) to the Secretary of the Yorkshire Philosophical Society, York, in order that adequate preparation and accommodation may be secured. It is proposed that the visitors shall assemble in the Museum and apartments of the Yorkshire Philosophical Society, to receive memoirs and communications, and that they shall dine together daily.

Persons arriving in York on the 26th of September, are requested to apply to the Porter of the Museum for information as to the hours and places of meeting.

Foreigners who may honour this meeting with their presence, will find every accommodation prepared for them.

London, May 25, 1831.

This meeting, which we believe was originally proposed by Dr. Brewster, will probably be attended by many of the leading men of Great Britain. Our private letters inform us, that Babbage, Murchison, Greenough, Conybeare, Daubeny, Brewster, Jameson, and a host of eminent persons, had intimated their intention of

being present. We have no doubt it will produce the most beneficial effects to science, smoothing the asperities of rivalry, and creating a personal bond between individuals, who have the loftiest objects in view. Under the direction of great minds, the influence of such institutions will be universally felt, and thus, ere long, it will be acknowledged, that to study nature and nature's laws, constitutes not only the most elevated, but the most useful of occupations.

ED.

## METEOROLOGICAL OBSERVATIONS,

*Kept at Wilmington, Delaware, by Henry Gibbons, M. D.*

## SUMMARY FOR AUGUST 1831.

<i>Therm.</i>	<i>Barom.</i>	
Average at sun-rise, 67°.23	in. 29.92	Proportion of clear weather, days 18
Average at mid-day, 78°.68	29.91	Proportion of cloudy, 13
Average at 10 P.M. 69°.74	29.91	Whole days clear, 13
Monthly average, 72°.95	29.915	Days on which rain fell, 8
Maximum, 85°.50	30.15	Depth of rain, inches 11.9
Minimum, 52°	29.68	Northerly wind prevailed, days 8
Range, 33°.50	.47	Easterly, 10
Warmest day (17th,) 80°.		Southerly, (S. to W.) 13
Coldest day (29th,) 60°.50		

Auroras, none. That observed in Massachusetts, (noticed in the last number,) on the 31st. ult. was followed by unsettled weather, and a severe easterly storm in a week. A very wet month; rains heavy; nearly six inches fell on the 8th and 9th. The early part of the month cool; the remainder warm, except the few last days. Winds generally light and variable. But few electric clouds. A severe easterly storm on the 7th and 8th. A peculiar haziness in the atmosphere during this month, and the last, which will be noticed hereafter.

## SUMMARY FOR SEPTEMBER 1831.

<i>Therm.</i>	<i>Barom.</i>	
Average at sun-rise, 58°.03	in. 29.85	Proportion of clear weather, days 16
Average at mid-day, 70°.90	29.83	Proportion of cloudy, 14
Average at 10 P.M. 60°.36	29.82	Whole days clear, 12
Monthly Average, 64°.46	29.84	Days on which rain fell, 10
Maximum, 83°.	30.04	Quantity of rain, inches 7.25
Minimum, 44°.	29.44	Northerly winds prevailed, days 11
Range, 39°.	.60	Easterly, 7
Warmest day, (11th,) 77°.		Southerly, (S. to W.) 12
Coldest days (17th and 30th)	55°.	

Auroras, none. A wet month; rains frequent but not very heavy. Generally cool; only a few warm days. Winds not so light nor so changeable as in the summer months. Electric clouds more frequent than in August. Four easterly storms, two of them light, and one not accompanied with rain. A partial white frost on the 30th.

## SUMMARY FOR OCTOBER 1831.

<i>Therm.</i>	<i>Barom.</i>	
Average at sun-rise, 48°.81	in. 29.87	Proportion of clear weather <i>days</i> 23
Average at mid-day, 62°.43	29.84	Proportion of cloudy, 8
Average at 10 P. M., 51°.74	29.84	Whole days clear, 19
Monthly average, 55°.65	29.855	Days on which rain fell, 8
Maximum, 75°.	30.18	Quantity of rain, <i>inches</i> 8
Minimum, 36°.	29.39	Northerly winds prevailed, <i>days</i> 12
Range, 39°.	.79	Easterly, 6
Warmest day (3rd,) 67°.50		Southerly, (S. to W.) 13
Coldest day (28th,) 44°.		

An aurora, on the 29th, followed in two days by a transient easterly storm, and subsequently by northerly winds. Several heavy rains this month; six inches fell on the 8th, 9th, and 10th. Temperature moderate and seasonable; the middle portion of the month delightful. Winds tolerably constant; during the first week, and also in the last week, stormy. A few electric clouds in the first week. One slight easterly storm, following the aurora; also a violent storm from north, with heavy rain, of 36 hours duration, on the 9th, and 10th. Several partial frosts, and one pretty general one, with ice in places, on the 29th; but the tomato (*Solanum Lycopersicon*) and other garden vegetables which are considered sensitive to frost, appear very little injured yet. The haziness of the atmosphere, observed during the summer, continued through this month. The sky was scarcely ever clear of it.

*Account of an ancient Body, found in a Bog in Ireland.*—The body of a man, in a bog ten and a half feet deep, was found about nine feet below the surface. The abdomen was collapsed, but it, in all other respects, bore the appearance of recent death. The face was that of a youth of fine features, with hair long and black, loosely hanging over the shoulders. The dress, which was tight, and reached to the elbows and knees, was composed of the skin of an animal, probably the moose deer, laced with thongs, and having the hair inwards. There were no weapons, but a long staff or pole was laid on each side the body. Varro derives the Sagum of the Romans from the Sac, or skin dress of the Gauls and Britons, which probably was tight, and not flowing, from the nature of the material. The Suevi according to Tacitus bore flowing hair, and the staffs were familiar to the Silures, according to the same author. From the depth at which it was found, an immense period of time must have passed to admit of nine feet of vegetable matter having grown over the body, and all the circumstances concur to make it probable that the body was of a very remote period; for before the arrival of the English, the Irish wore, for the most part, ill made garments, made from their black sheep.—*Abstract of a paper in Edin. N. Phil. Jour. June 1831.*

*Collection of Natural History from India.*—M. Delamare Picot has brought from India, into France, an extraordinary collection, for a private individual, of objects in natural history, and of Indian antiquities. Fifty three species of Mammifera, among which the Rhinoceros *Javanus*, found hitherto in Java only, and which the Jardin des Plantes did not possess.

*Pros. R. A. S. of Paris.*



Plate VIII.

Centre of the Earth

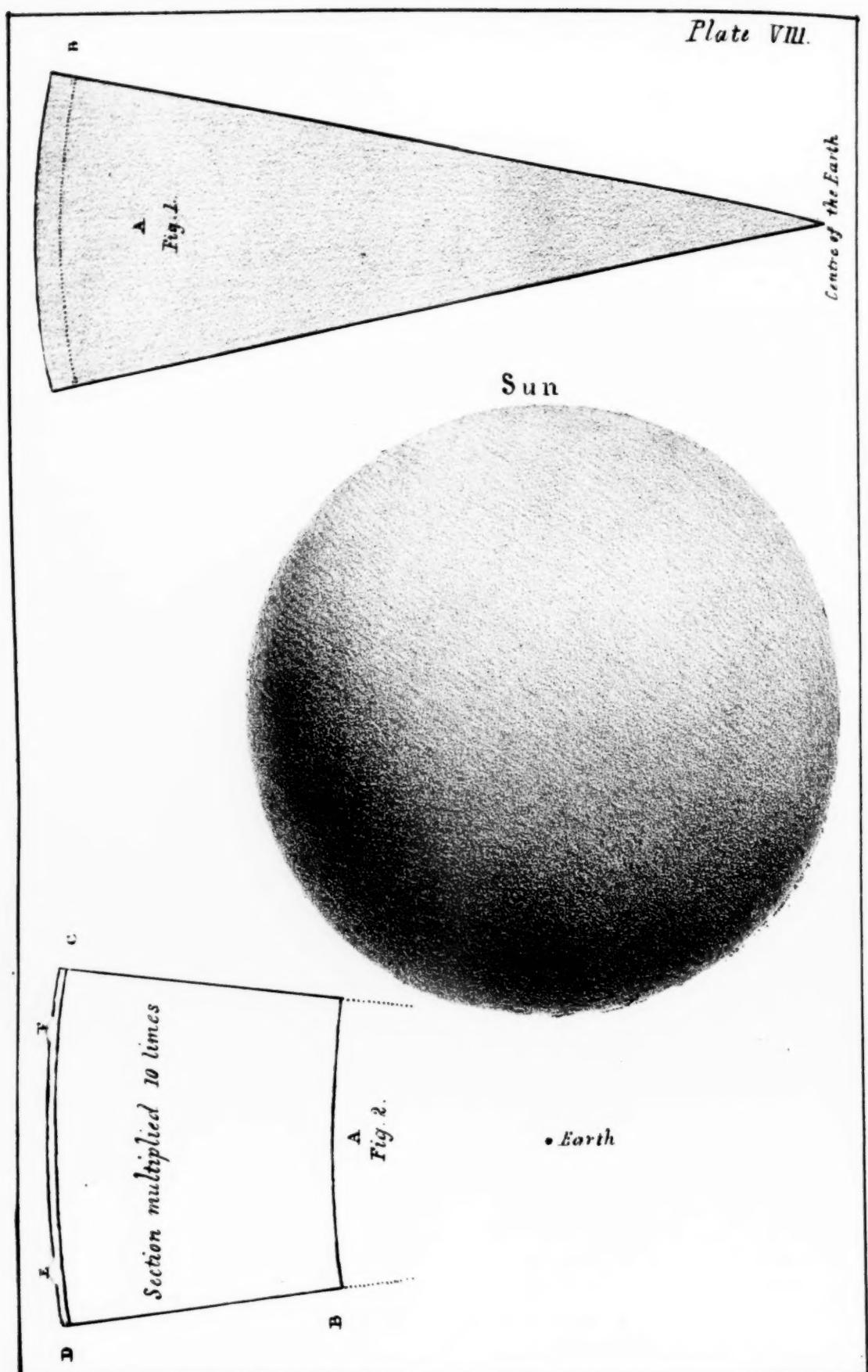
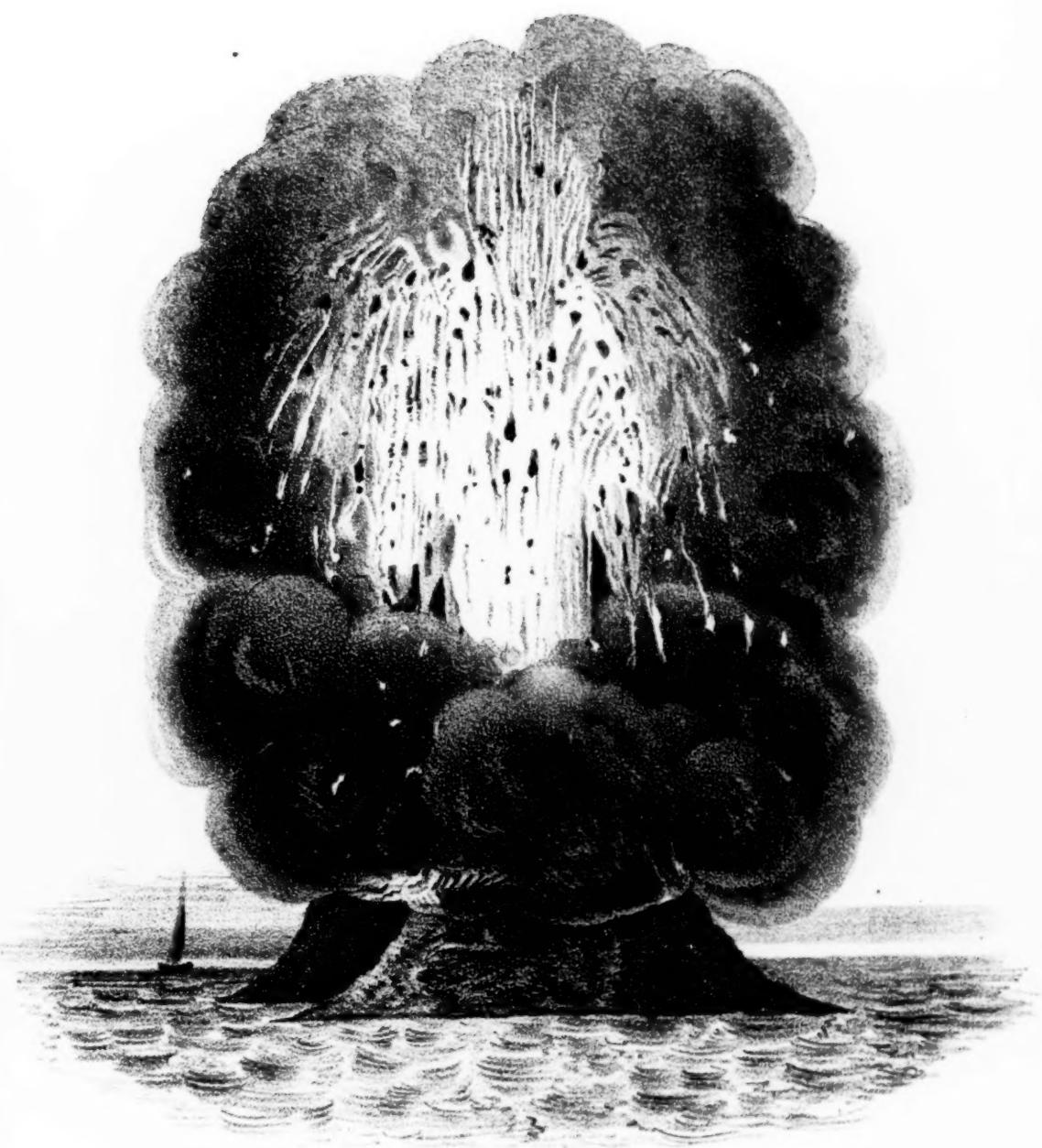


Diagram for the Essay on the Crust of the Earth.

C & L. lith



MOTHAM ISLAND.  
 $37^{\circ}7'30''N$  Lat  $12^{\circ}41'E$  Long

*from Childs & Farmer's Press*